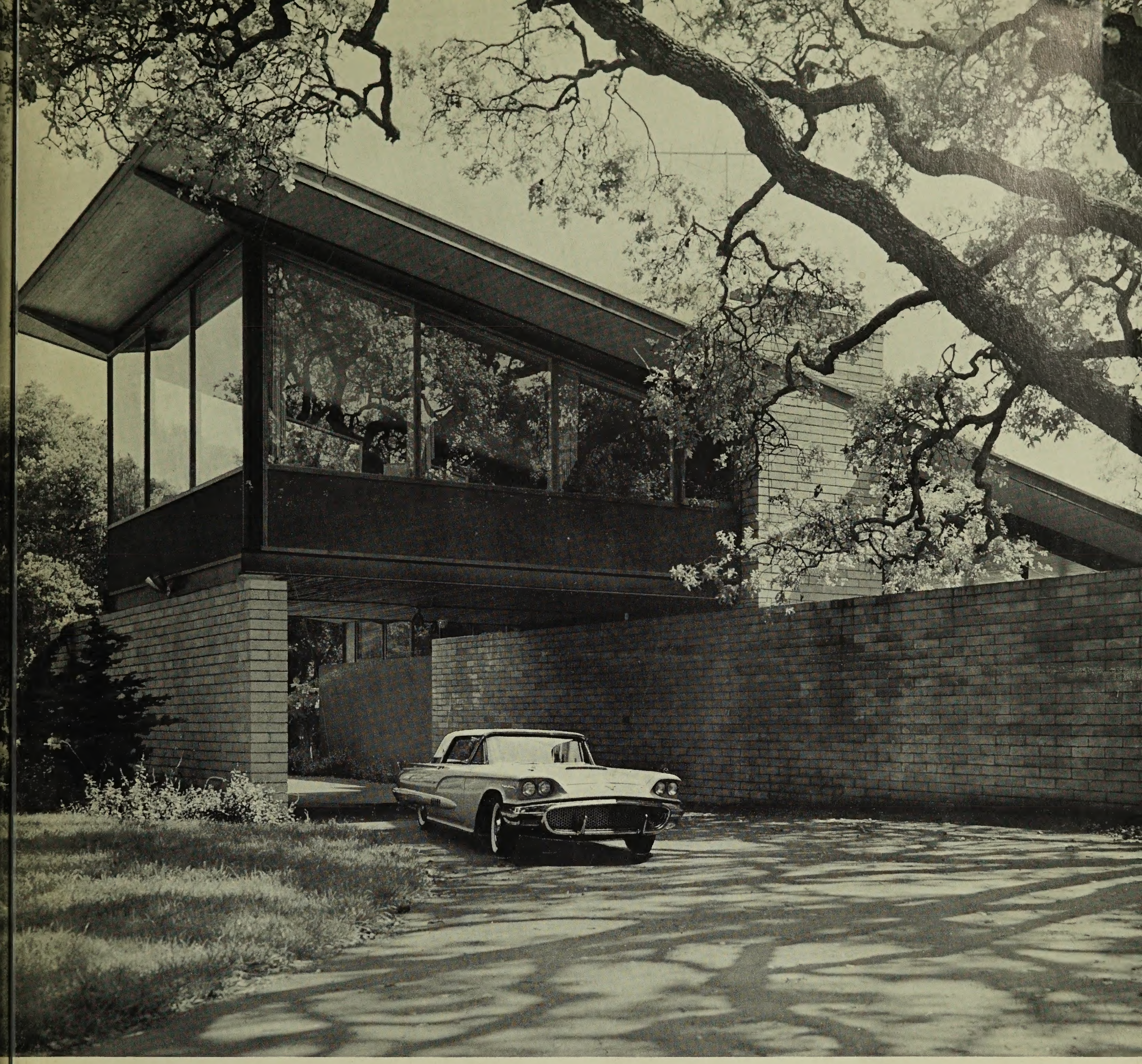


WHAT LEADING MAGAZINES ARE SAYING ABOUT

Steel Framing for Homes

Compliments of

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

BETHLEHEM STEEL

Table of Contents

TITLE	PAGE
It doubles the space, but not the cost *(Better Homes and Gardens)*	1
Steel framing for "impossible" lot *(Pacific Architect and Builder)*	4
This house marks a big step *(House and Home)*	6
Exposed steel frames modular Illinois home *(Architectural Record)*	11
Mississippi house invites southern breezes *(Architectural Record)*	15
Steel and cork enclose a tent-shaped addition *(Architectural Record)*	18
Steel vs. wood: how much change will people take? *(House and Home)*	20
With steel components like these you can build a house *(House and Home)*	24
Will steel for framing give wood a run for the money? *(American Builder)*	35

In reprinting the above articles, we offer under one cover some interesting and useful material on the use of steel framing in homes. We acknowledge the developmental and experimental work done by architects, structural designers, steel fabricators and contractors in the imaginative use of light steel framing for modern houses. We also gratefully acknowledge the permission of the publishers to reprint the material.

BETHLEHEM STEEL

FIVE STAR HOME 2805
YOU CAN BUY PLANS
®

SEE PAGE 196

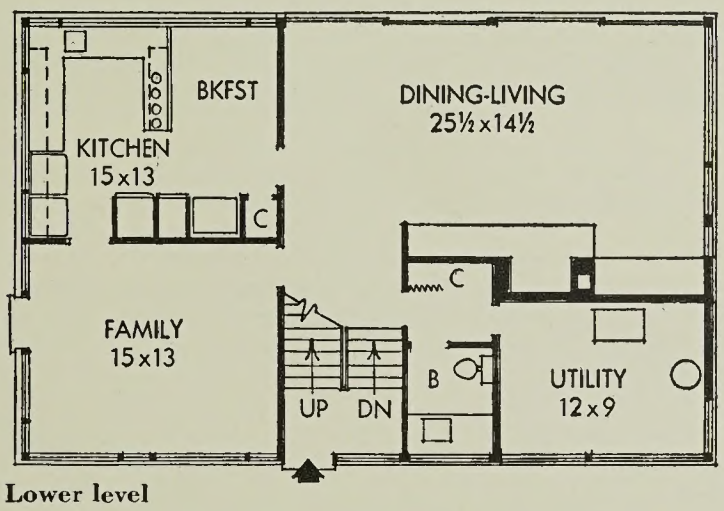
It doubles the space, but not the cost

When it comes to enclosing space for living—pure and simple space—the two-story house comes into its own. Dollar cost per square foot is minimum; so's the land you devote to building.

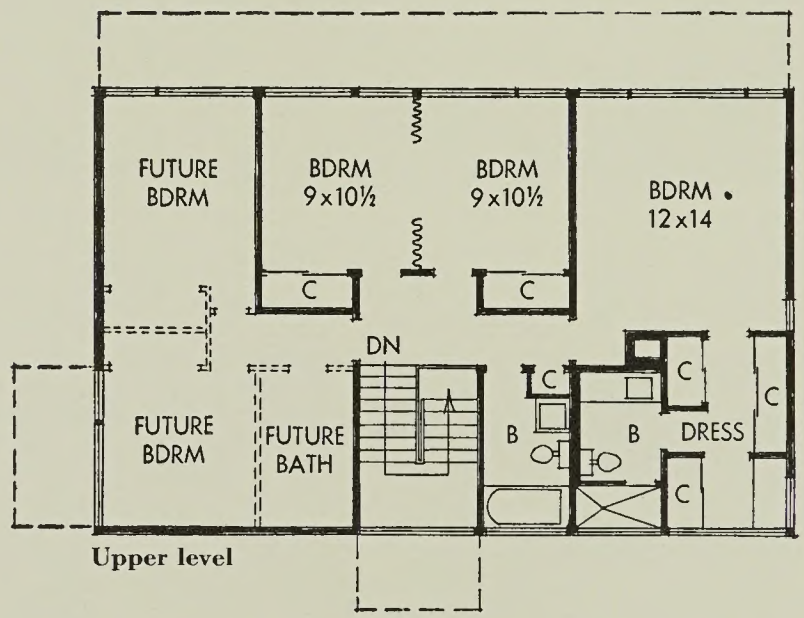
But a *good* two-story house, nowadays, is hard to find. Many single-level homes *look* better and *live* better. We searched the country for a two-story that could stand up and answer all arguments. Here it is—Five Star Home 2805.

The owners, the Leon Groissers of Lexington, Massachusetts, wanted a feeling of space in a house where living divisions were strictly maintained. A two-story [*Turn to page 190*

By John Normile, A.I.A.

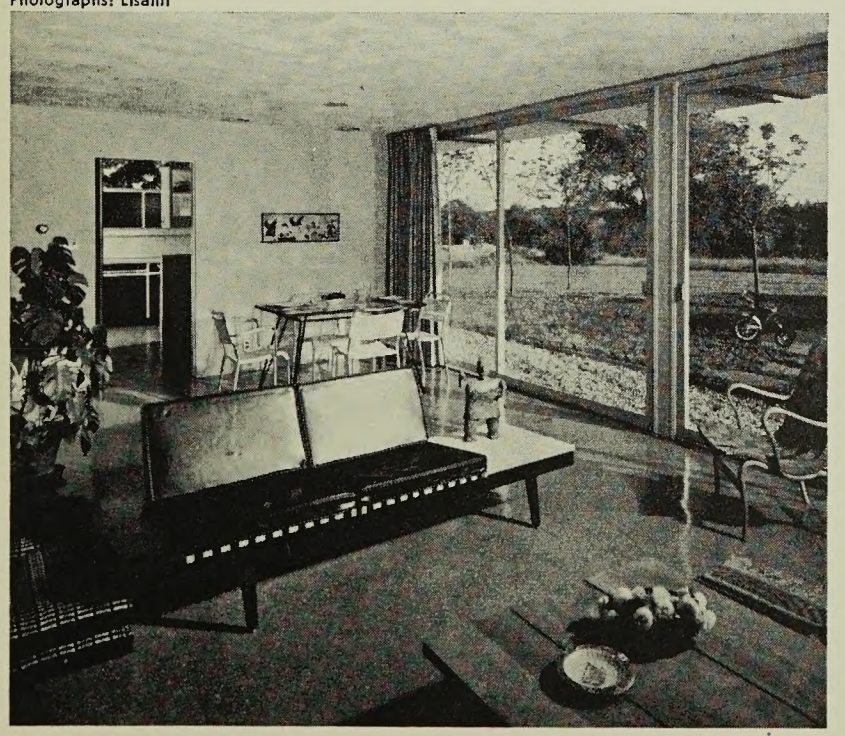


Lower level

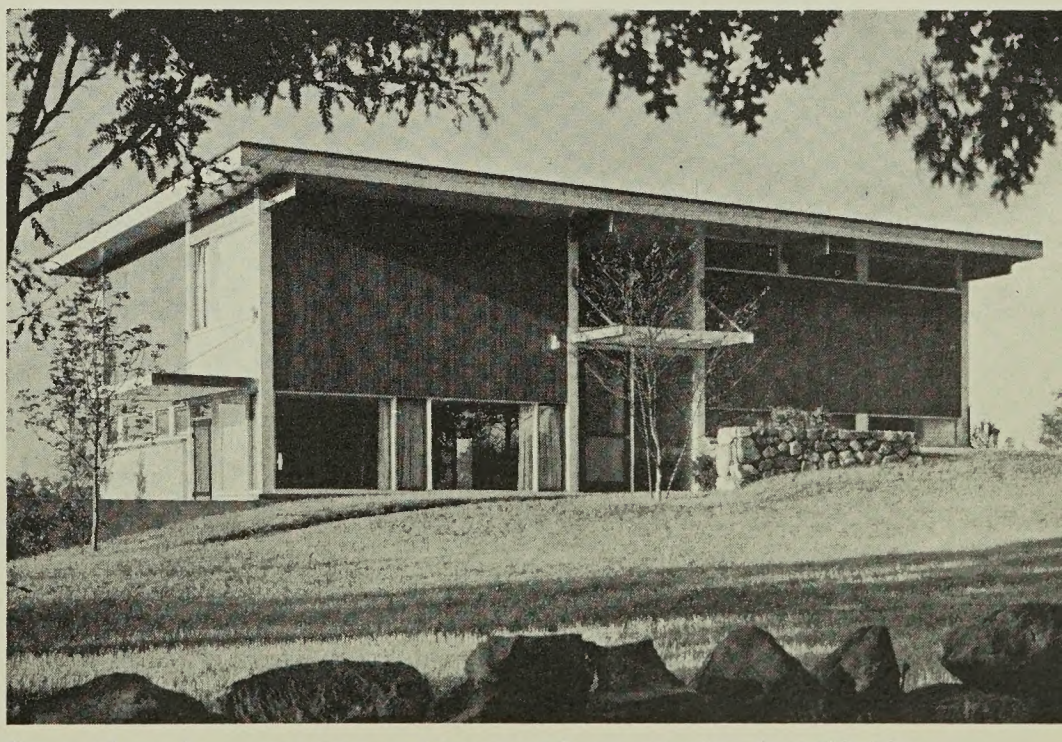


Upper level

Photographs: Lisanti



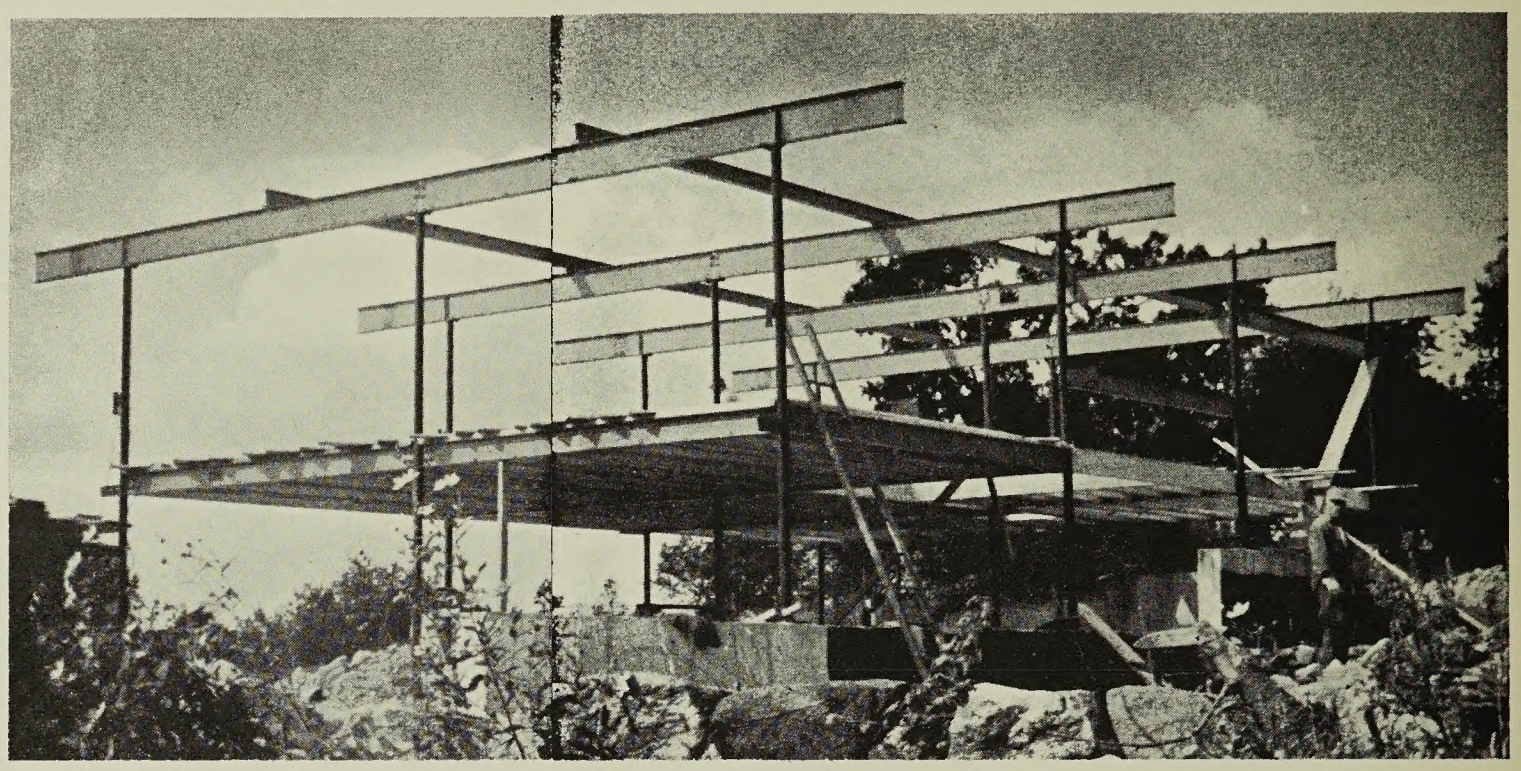
Looking toward kitchen and dining side of living room, you see more of expansive view through sliding glass walls. Gravel pathway, as wide as roof sunshade, prevents mud from splashing on house in a driving rain. There's a choice of two eating areas in this house—one you see in formal dining room here, while other is in breakfast room beyond.



Front of house has center entry, set into a neat frame extending the full height of both stories. You enter on a landing midway between living and sleeping levels. Both front door and entrance to family room (at left) are sheltered by canopy of same style as sunshade over living room. Walkway from front door leads toward garage, off picture at left.

It doubles the space, but not the cost

Begins on page 62



Construction was based on simple, square framework of steel. Thin but sturdy I-beams rest atop slender columns, extend to support wide overhang.

Frame was erected quickly, then roofed over. Remainder of construction work was protected from weather. Note big, open rectangles at left where finished panels will be fitted.

Since steel frame carries load, interior (nonload-bearing) walls could be arranged as desired.

house—with up-to-date planning and construction methods—fitted their needs.

To tell you *why* this house was so successful, we went to its designers, The Architects Collaborative, of nearby Cambridge. Here's what they had to say about it:

"Different families have different needs. Houses can be designed to reflect those individual needs—and *because* of them become more expressive and delightful.

"Some sections of the house flow together. The living and dining rooms form an interrelated area, as do the kitchen and family room. The two-story stairwell and open detailing of the stair create a spacious effect while joining the two levels.

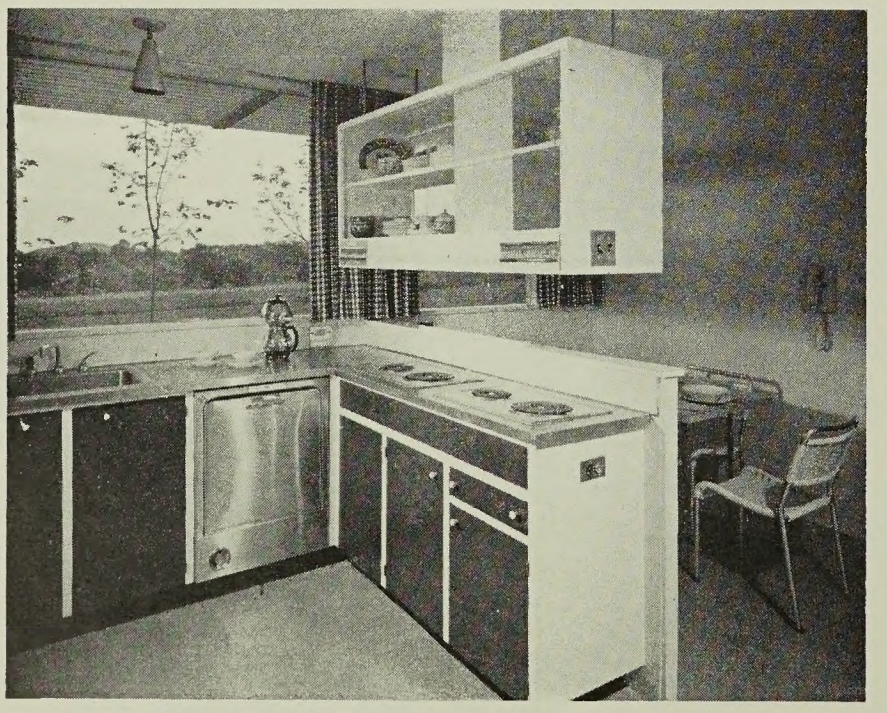
"Upstairs, the Groissers wanted separation of the rooms—except for the two children's bedrooms, which are joined by a sliding partition. The master bedroom is a self-sufficient unit, with bath, dressing alcove, and built-in desk. At the opposite end of the hall is an attic-size storage space that can become two more bedrooms and bath!

"Some unusual structural ideas lent themselves well to this house. A steel frame was erected on 12-foot centers; the exterior walls—in prebuilt panels—were quickly installed. The widely spaced columns, covered by wood trim, add a dignity and order to the house. With simple, sound construction to start with, both architect and owner were enthusiastic in working out the interior and exterior details."

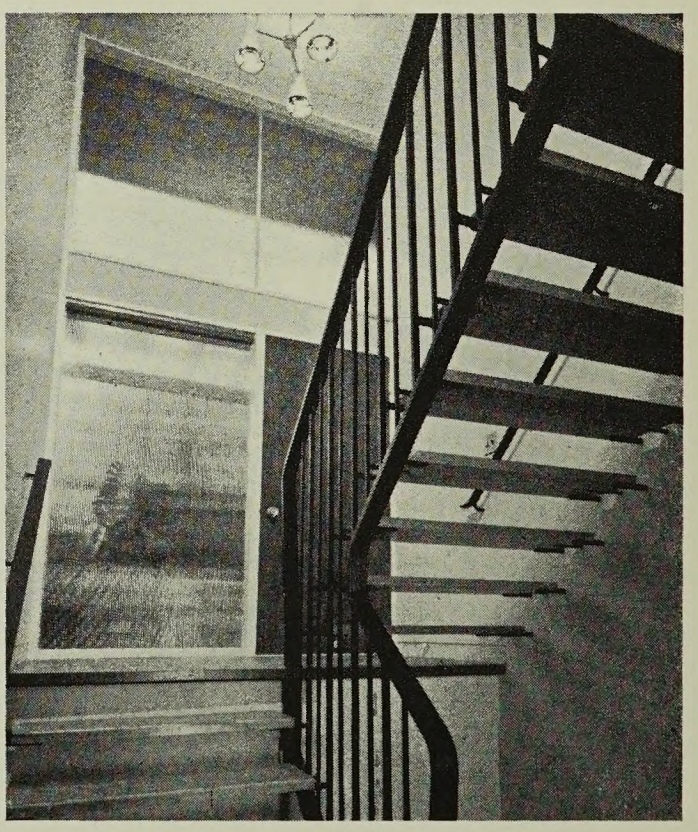
These details, we might add, are good enough in themselves to make this house outstanding. The entrance door—opening on a landing midway between the two levels—skillfully joins upstairs and down, indoors and out. (Its canopy repeats, emphasizes strong horizontal line of roof.)

And when you add plenty of living space, this house is hard to beat. Over-all size is just 42x27 feet—but the two levels enclose 2,268 square feet (including 312 feet of unfinished upstairs bedrooms).

How to get plans, page 196



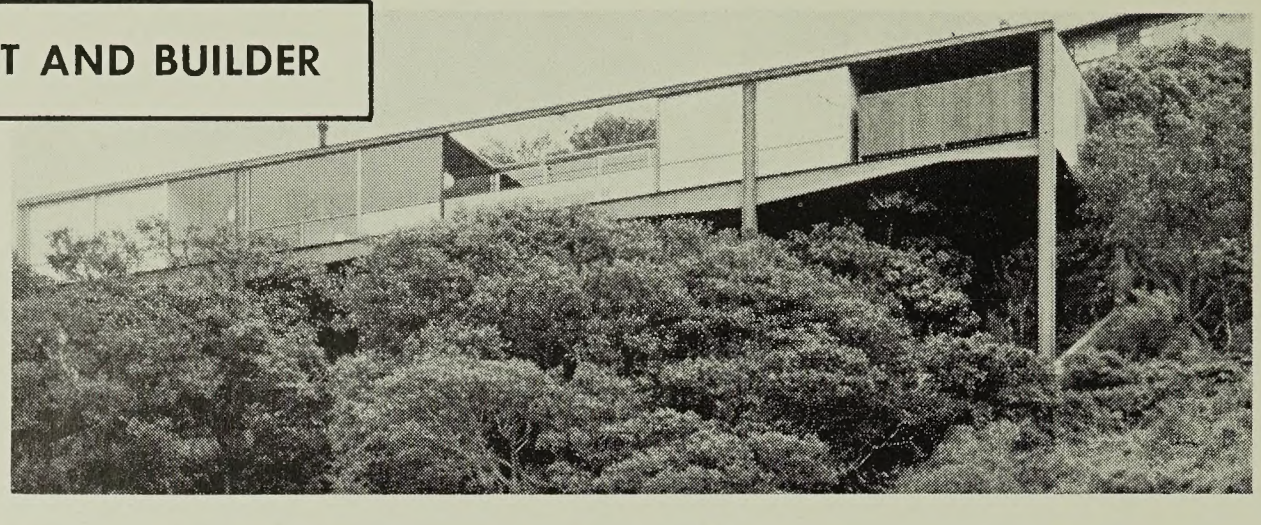
Kitchen has smart-looking, stepsaving "U" shape. Cooking equipment's at this end, storage opposite (just off picture). Hanging cabinet between kitchen and informal eating room visually divides two areas—but doesn't seal them off. Cabinet has unusual eye-level cooking controls. Extra wiring puts buttons beyond a child's reach.



Fluted glass panels light entry area, stairwell, and part of each level. They give impressive, enlarged appearance to this small, landing-type entry hall. Sturdy iron railings on both sides increase stair safety. Traffic flows as in split-level—up to bedrooms, down to living area.

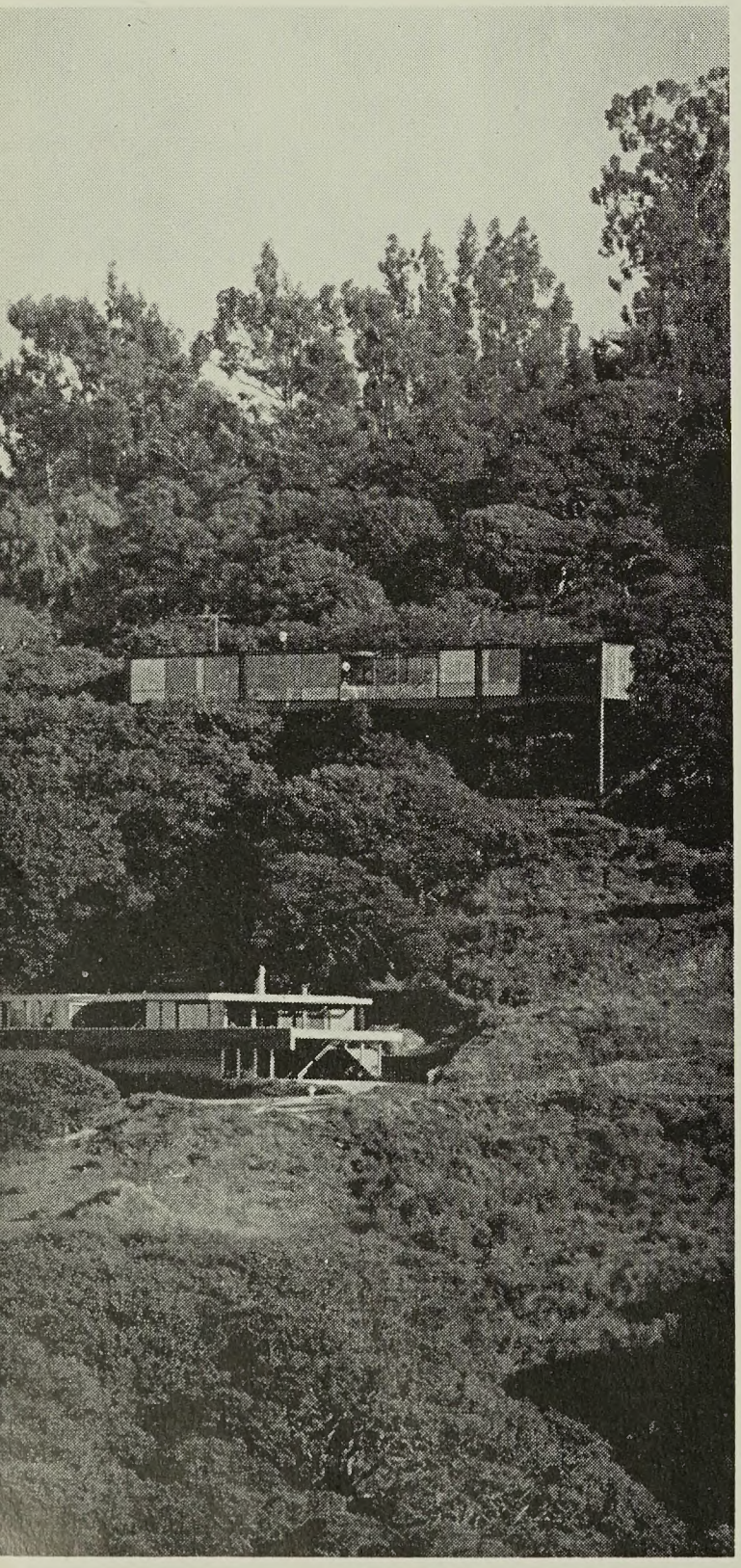
Rear exterior is handsome to behold. Materials are framed into rectangles of varying size, blended to form this exciting picture. Sliding glass walls open living and dining areas to attractive stone terrace—handy for entertaining.

Ground-level living room is well arranged for conversation, as well as for enjoyment of fireplace and view through sliding glass. Facing rear of lot, room enjoys complete privacy. End wall has unusual high and low bands of glass.



Steel framing for 'impossible' lot

STEEL WORK consisting of wide flange sections used as supporting columns and set on low foundation of eight piers is visible on steep slope of 120x70-ft. lot on Sausalito promontory. Spanning gully is 50-ft. bay.



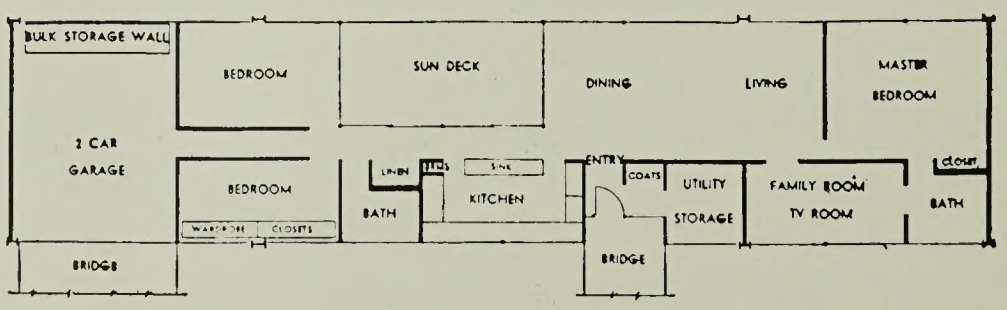
THE HILLSIDE SITE across from San Francisco Bay consisted of a slope of from 50 to 70% of uneven terrain covered by dense scrub oak, with a drain gully in its exact center. The architect turned for assistance to a civil engineer who went to steel framing for his structural design. He set the steelwork on the steep slope on a low foundation of eight piers connected with concrete tie beams, four piers at each end of the house.

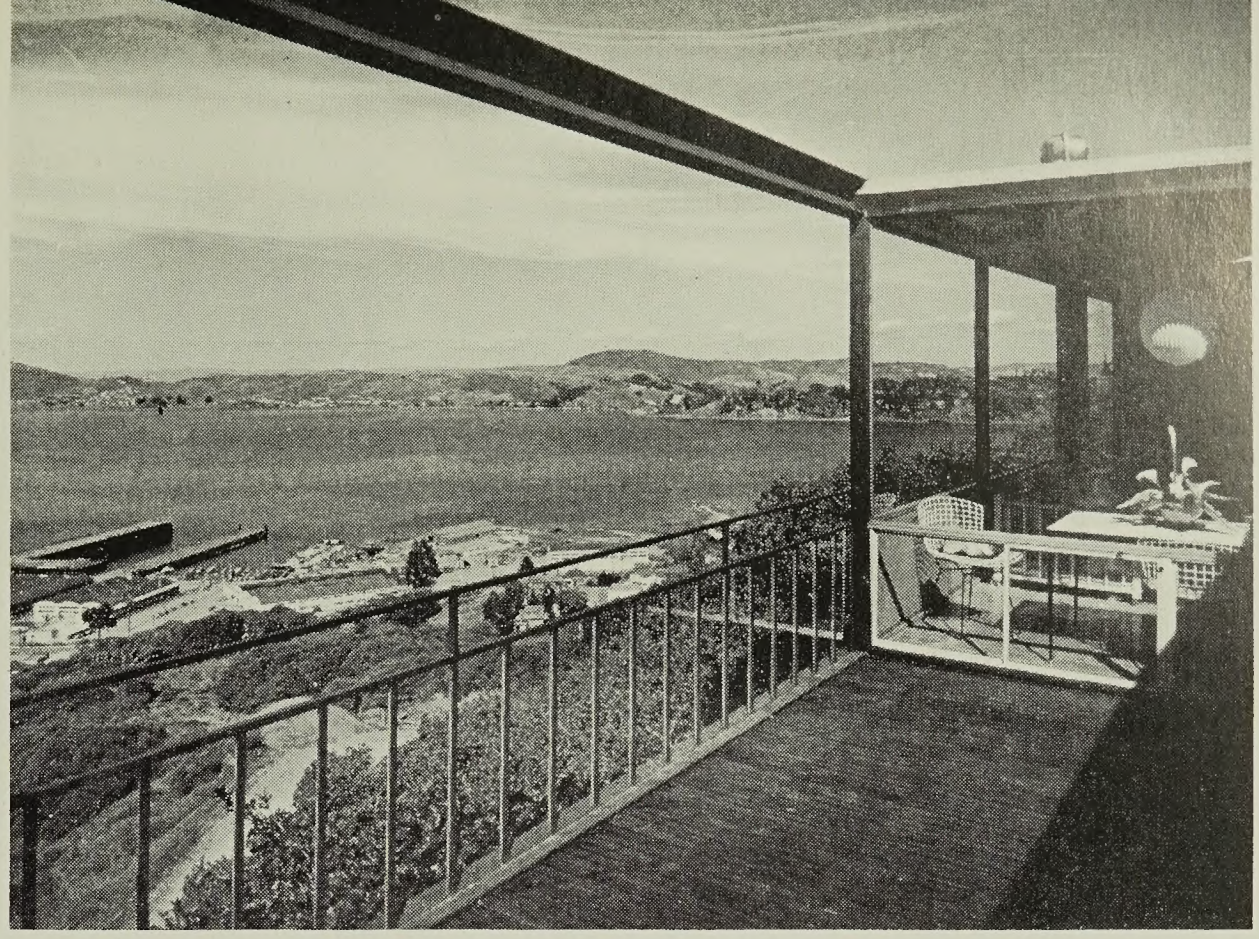
Flange sections 14 in. wide were used for the supporting columns. Bays for the 100x22½-ft. structure were 25, 50 and 25 ft., the 50-ft. bay spanning the gully. Connecting girders supporting the house were fashioned from 20-in. I-sections, diagonally torch-cut along the web, from 28- to 12-in. taper and rewelded. Eight-inch wide flange sections were used in the roof beams.

In the exposed design the steel was shaped to follow closely the appearance of the stress diagrams of the structure. The exposed pattern of hipped girders, with broken lines, served to break the monotony of square shapes and angles. The 50-ft. bay spanning the gully left this portion of the lot open and free of structural elements which might otherwise impede drainage or cause slipping in severe water runoffs.

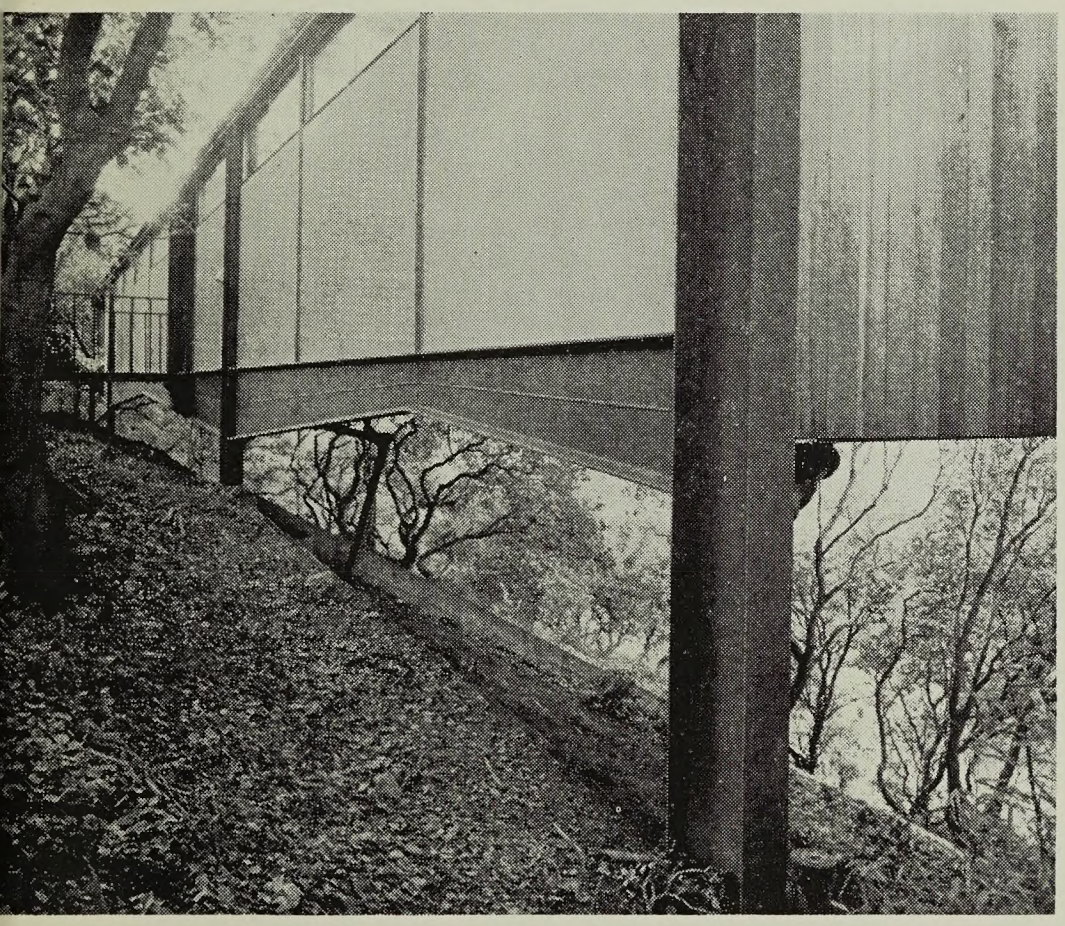
The 2,200 sq. ft. of living area was built for $24,000, or just under $11 per square foot. "Using the steel frame solved the costly problem of underpinning the house to elevate it to street level and the shorter time required for the steel work made the overall cost of the home lower," the engineer asserts.

Walls are of glass and plywood panels; the interiors are decorated in raw linen laid on fiberboard panels. Six layers of floor material, including one of cork, were placed over insulation. The rooms surround a glass enclosed deck overlooking the Marin Hills and Richardson Bay. When business took the architect to another city, the house was sold and the new owners rearranged several rooms for less than $1,000. They doubled the size of the children's bedrooms by converting the play area; and enlarged the master bedroom by moving it from the view side (now the family room) to the space formerly devoted to a study, separated from the living area by a movable partition.





OUTSIDE PATIO IS GLASS ENCLOSED on three sides. Steel framing eliminates interior bearing walls and columns which might otherwise limit view. Bridges lead to entry and to garage at extreme left.



OUTLINE SPECIFICATIONS

Structure: Steel (fabricated by Schrader Iron Works from rolled secions furnished by Bethlehem Pacific Coast Steel) on eight piers connected with concrete tie beams, four at each end of house; 14-in. flange sections for supporting columns; 20-in. I-sections (American Standard) for connecting girders.

Exterior Walls: Glass, plywood.

Roof: Tar and gravel.

Floors: Cork over five other layers of material and insulation (Celotex).

Interior Walls: Raw linen on fibreboard panels.

Ceilings: Exposed structural laminations.

Heating: Forced air.

Total Area: 2,200 sq. ft.

Total Cost: $24,000 (including utilities, fittings and sales tax, but does not cover alterations by new owners).

Cost per Square Foot: $11.

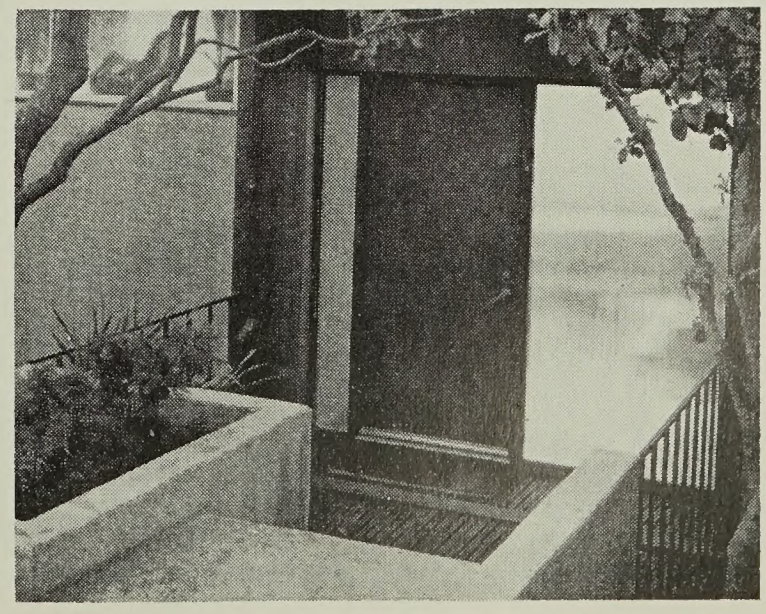
Date of Completion: January 1954.

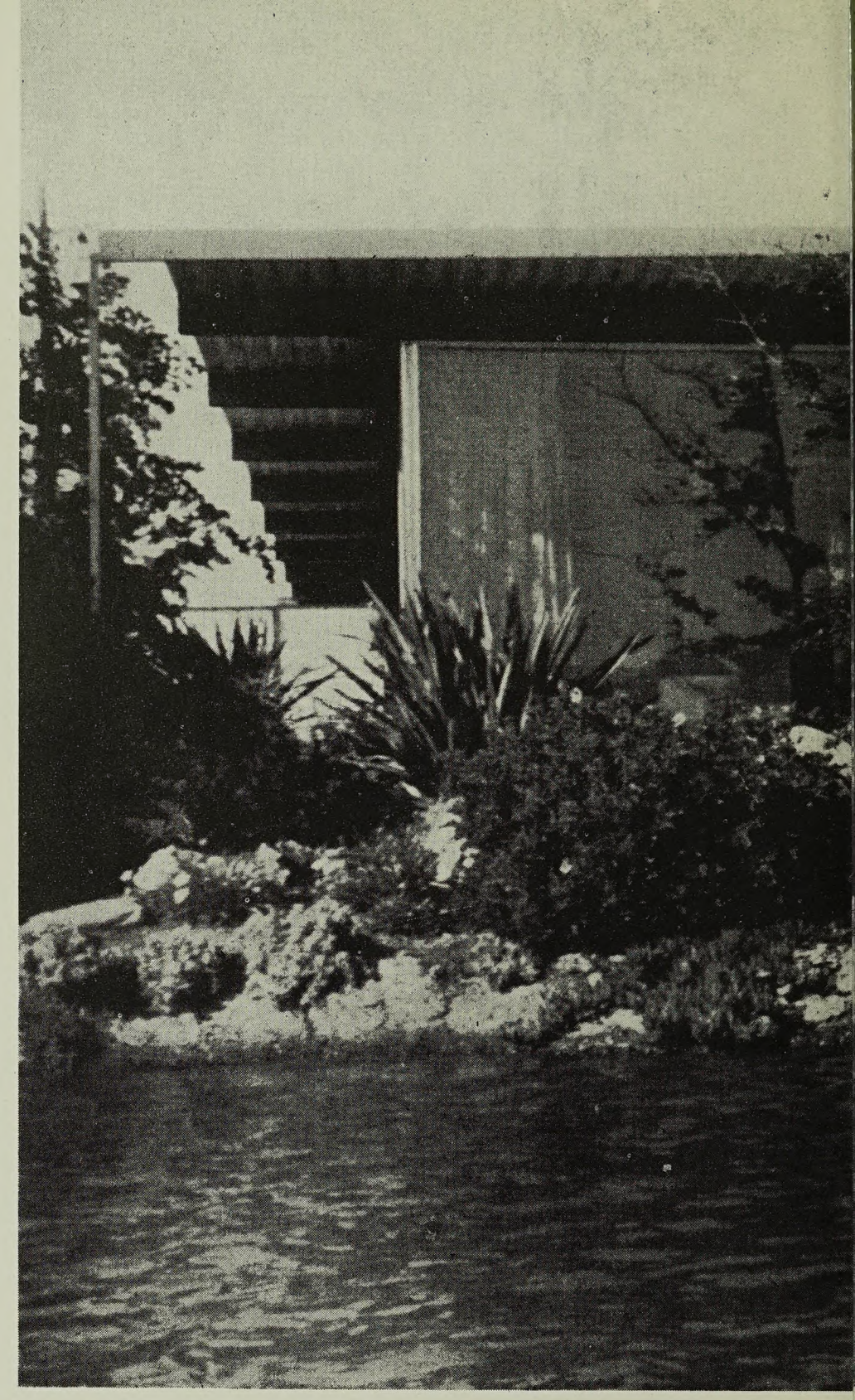
Sausalito, California

JOHN C. HOOPS, Architect

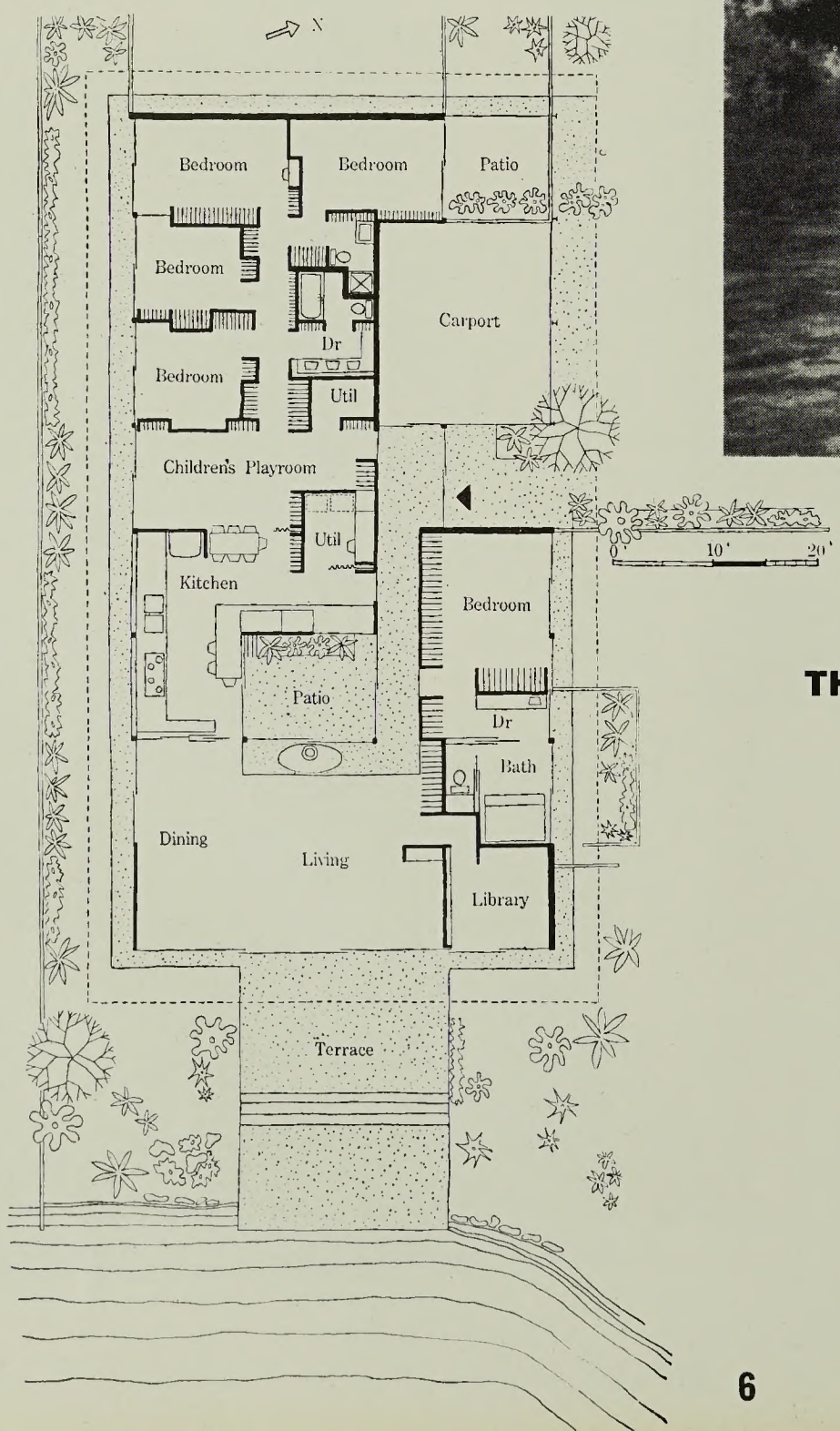
JOHN BROWN, Civil Engineer

A. G. CHRISTENSEN, Contractor





Plan was divided into two 40′x40′ squares, one for adults and one for children. Inner patio and kitchen form the connecting link. Outdoor play areas and patios are enclosed by screens.

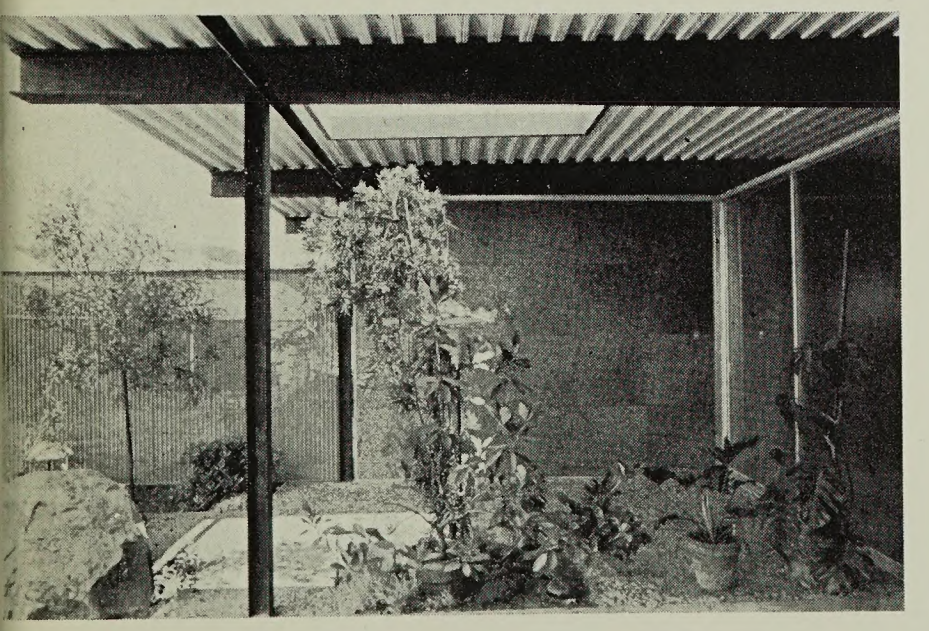


THIS HOUSE MARKS A BIG STEP in steel construction. It is the first steel-framed house ever built that takes full advantage of the strength of steel to use really long span beams. (It is also the first house in which a number of other construction problems were solved. For details, see the following pages.) The long span beams let the architect place all supporting columns on the exterior walls so the whole interior is free of structural framing. Many of the interior partitions are storage walls that can be easily moved to meet changing space requirements. And almost all the exterior walls are sliding glass doors that open to screened outdoor areas. Because the columns are along the side walls only, the lagoon end of the house has no structural framing to break the view.

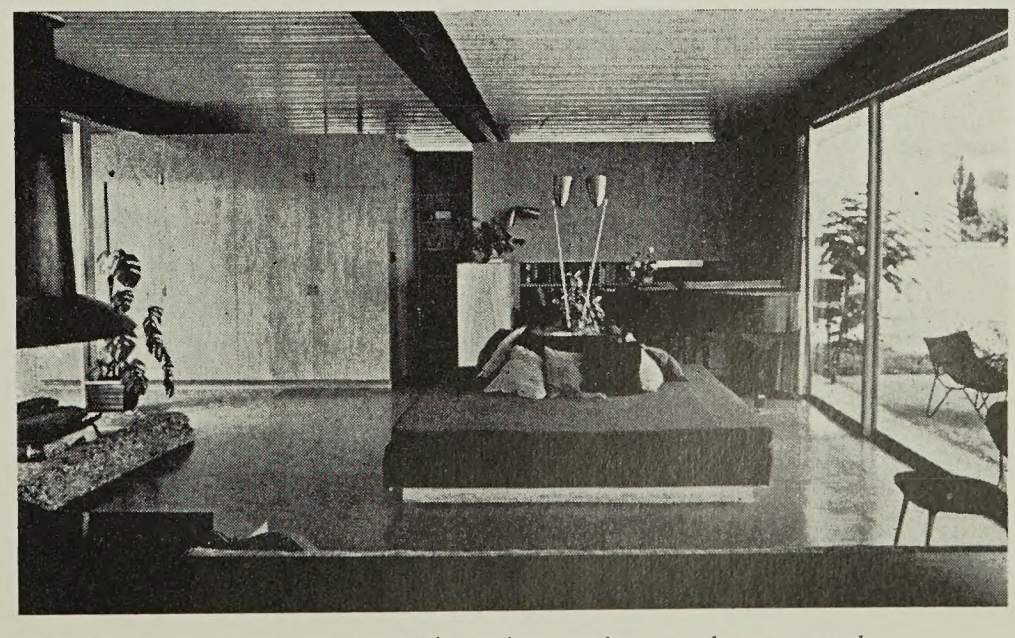
In Belvedere, Calif. Raphael Soriano, architect.

All-glass walls, made possible by structural system, leave view clear.

Photos: Elizabeth Soriano



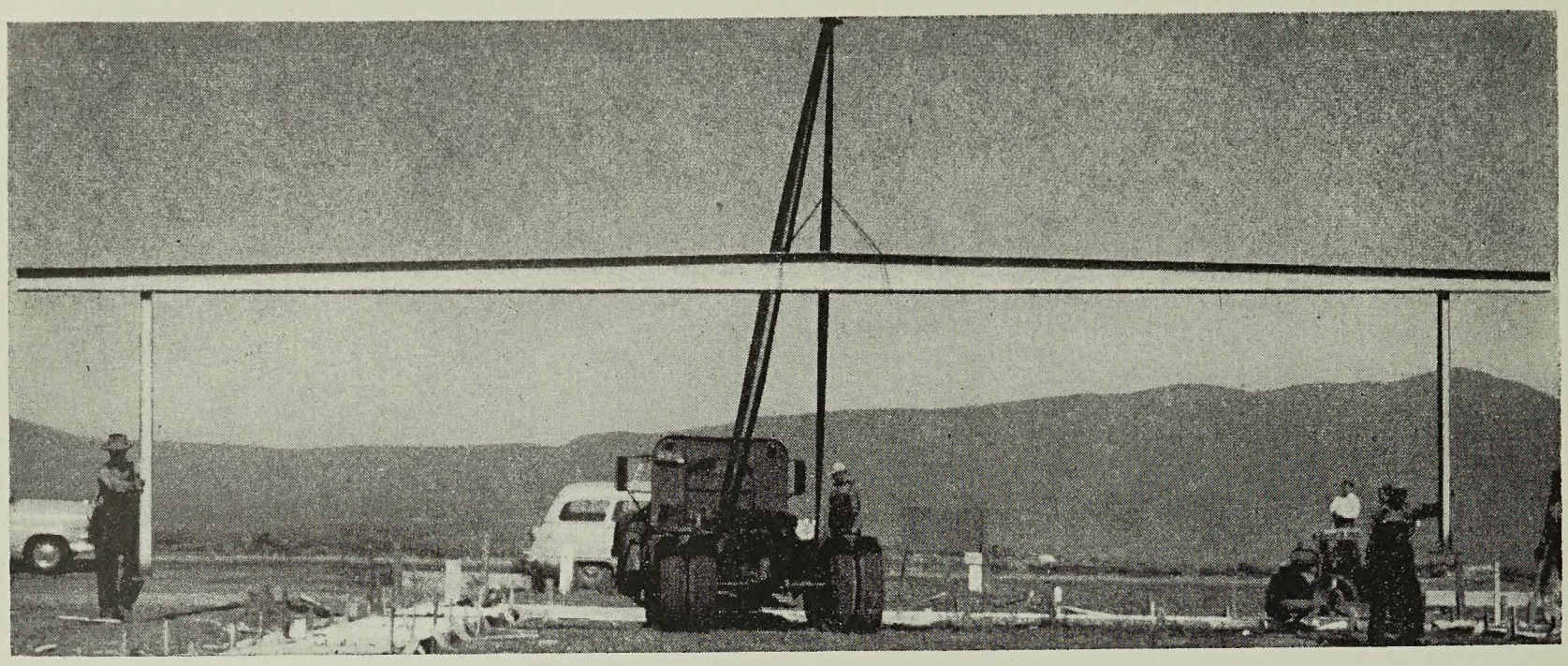
Wall at entrance is faced with cork; core is marine plywood.

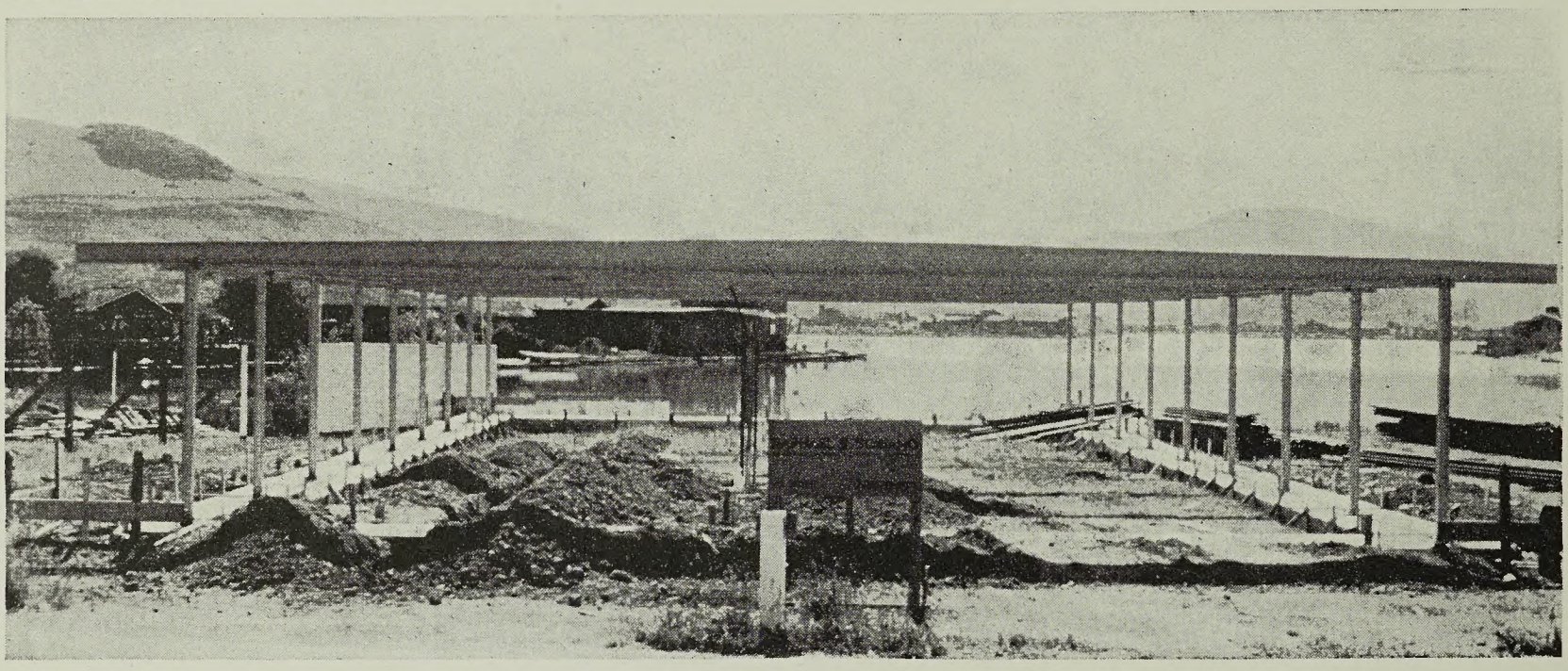


Most interior walls are storage cabinets that can be moved or removed.

continued on next page

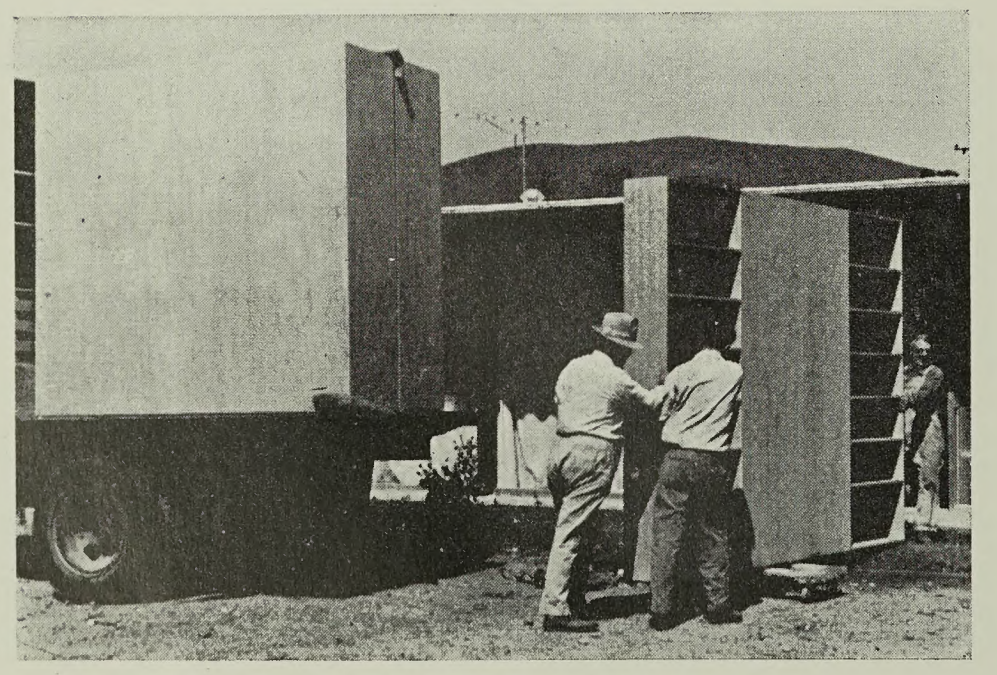
Presentation of this house starts on page 104



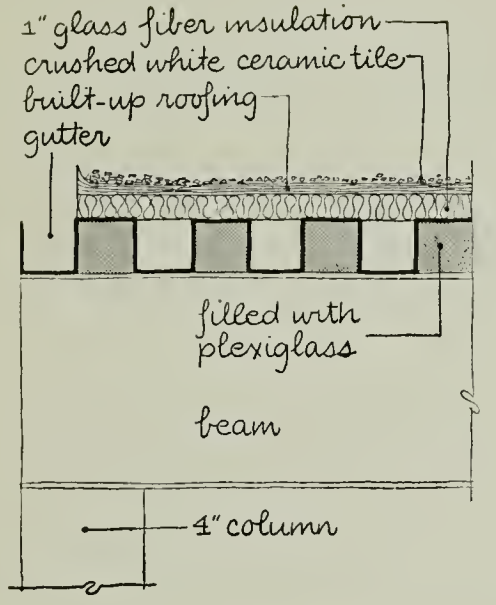


THESE WELDED STEEL BEAMS SPAN 40 FEET! In Soriano's earlier Los Angeles house (H&H, Nov. '51) the span was 20′. In a second house (H&H, Dec. '55) the span was only 25′. In this new house the span is 40′, plus a 4½′ overhang on each side. To get this span without excessive depth, Soriano used a tapered beam instead of a rolled section. The beam was cut in the designed shape from sheet steel, and the flanges welded on. Beams and columns were made up as a complete unit, trucked to the site, and bolted 10′ o.c. to the foundation. Soriano used a 10′ spacing because he could get good competitive bidding on that length roof deck. The steel deck, welded to the framing, is both the finished ceiling and the roof structure.

Interior partitions are storage walls or 3″ sandwich panels. The panels are 1″ plywood, faced with 1″ layers of refrigerator-insulating cork. It cost 19¢ a sq. ft. Storage walls, sandwich panels, and exterior window walls are all 8′ high, so they fit to the underside of the beams. The remaining space to the steel decking was filled with Plexiglass. It cost 80¢ a sq. ft., was put in without putty, molding, or breakage./END



Shopbuilt cabinets were installed after frame, are movable for flexibility.



Edge of the corrugated steel decking serves as gutter; roof insulation and built-up roofing stop short of it (left). Insulation is 1" fiberglass on top of the decking, covered by crushed white ceramic tile to reflect heat, keep it from decomposing the built-up roofing. Screening (right) is an aluminum acoustical material.

Steel deck's corrugations, open over the beams, (top of photo, below), were another major problem in steel construction. Soriano used Plexiglass, cut ⅛" too big, and with two helpers, plugged the corrugations himself. Entrance floor and fireplace base are of Mexican agate pebbles, which have a natural polish.

TOM YEE

EXPOSED STEEL FRAMES MODULAR ILLINOIS HOME

THE PROSPECT OF BUILDING a house in the woods often creates visions of a structure straight from *Hansel and Gretel*, or at least of interiors overlaid with tanbark rusticity. In this house for Ben Rose in Highland Park, Illinois, Architectural Designer A. James Speyer has deliberately ignored all the old cliches — and with great success.

Such citified materials as steel and wide glass expanses have been used to create a house that makes living on a wooded site a constant panoramic delight. The entire house is raised on the steel columns, which have individual footings, in order to disturb the natural forest landscape as little as possible.

The very simplicity of the house makes it seem quite at home in this setting; its glass walls make little interruption in the scene, and the trees, in turn, add shade and privacy. The street facade, however, is entirely of windowless wood siding, except for panels of obscure glass in the entrance loggia.

THE NEIGHBORHOOD: Highland Park, Illinois, is a suburban community near Chicago. It is generally a typical suburban arrangement of streets and lots, with houses set well back from the tree-lined streets. The architecture varies from the most traditional to modern of all kinds.

THE SITE: formerly part of a large estate, the land is in a pristine forest condition, and seems larger than its actual acreage because it borders on similar remnants of the old estate. A deep ravine edges the back of the property and increases its woodsy atmosphere.

A. James Speyer, Designer. George E. Danforth, Associated Architect. Frank Kornacker, Structural Engineer. Joseph P. Bazzoni, Mechanical Engineer. Tilander Bros., Inc., Contractor.

The living room of the Ben Rose house is virtually a steel-framed glass box, perched lightly in its wooded setting. The large room can be made as open or closed as desired by adjusting the curtains over the glass

HARRY CALLAHAN

The Family: Mr. and Mrs. Ben Rose have two young sons. Mr. Rose is a fabric designer, and required a studio-workshop to do experimental silk screen printing for his designs. The family preferred to have small bedrooms in order to afford a really large living room.

The House: the steel frame, painted a dark Indian Red, has regular ten-foot bays. The bay width was established as a minimum size for the bedrooms. Floor and roof slabs are structural cedar decking. The cedar is left exposed as ceiling finish in most of the house. In the living room, four plaster panels form a dropped ceiling and contain radiant heating coils to augment the baseboard radiation in this large room.

In plan, the house has well defined living, sleeping and service zones, with baths and storage lining the blank facade. All baths are illuminated by skylights. Circulation is very convenient throughout. The bedroom nearest the entrance hall doubles as playroom or study for the children. The studio has sliding doors, can be joined with entry.

The living room is quite big, and its three walls of glass make it seem even larger. A free-standing fireplace and screen and curtain dividers permit a wide variety of possible furniture arrangements in the area. The lower sections of the windows open for ventilation.

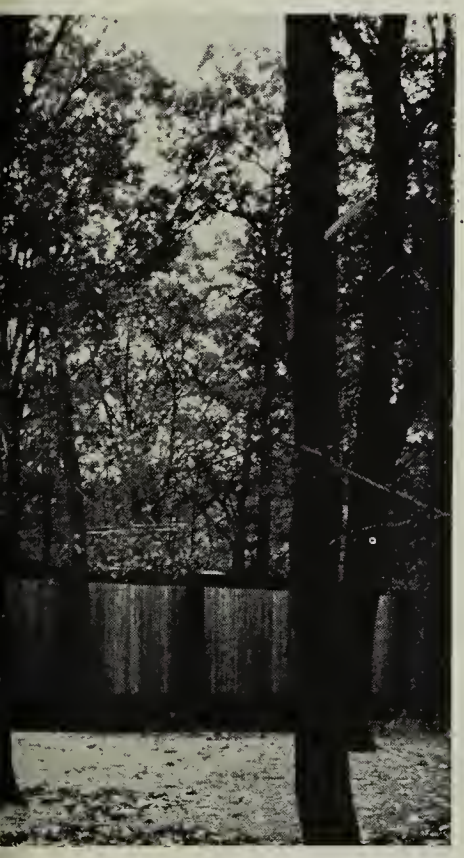
The Architectural Designer: A. James Speyer remarks that, "The character of the house was suggested by the wooded site — a kind of 'house in the woods', simple, not too insistent, but clearly placed there, a foreign but sympathetic object in the natural surroundings."

Owners' Reaction: the long glass walls form ideal display and testing areas for the fabrics Ben Rose designs; and the layout gives a studio location set apart from regular family activities.

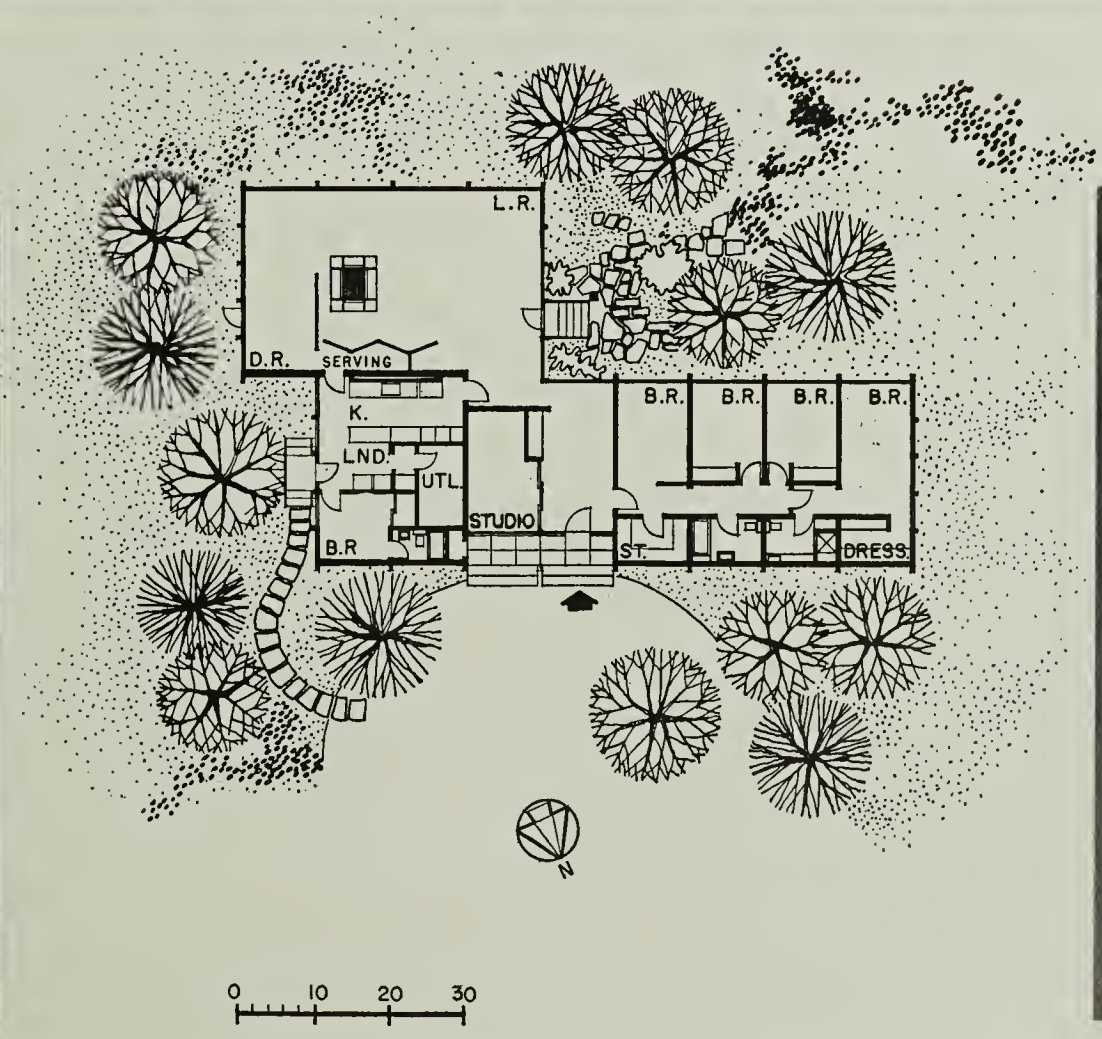
The facade of the Ben Rose house (below) gives little indication of the actual openness of the house, but lends a quiet privacy. Width of bedroom (below, left) sets standard bay width for the entire house; living room (right) is four bays wide

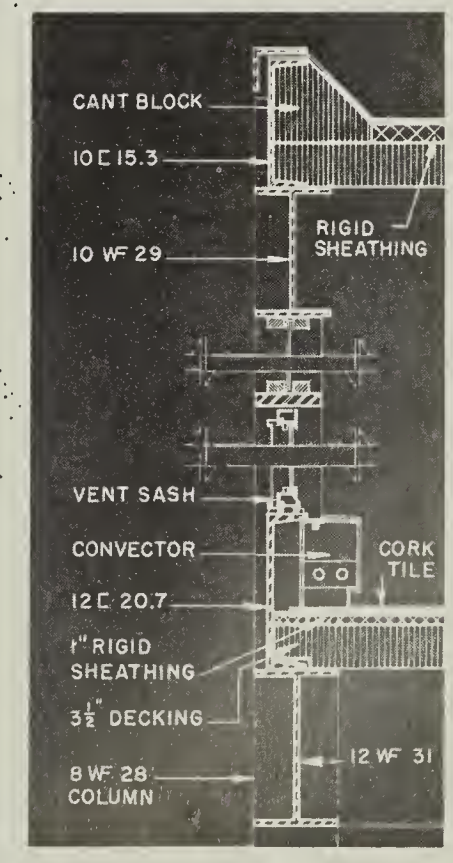
TOM YEE

TOM YEE



HARRY CALLAHAN





ARCHITECTURAL RECORD

MISSISSIPPI HOUSE INVITES SOUTHERN BREEZES

ALTHOUGH THIS HOUSE is much larger than the other examples, its highly successful regional qualities and interesting plan arrangement for a large family make it a vital addition to the collection.

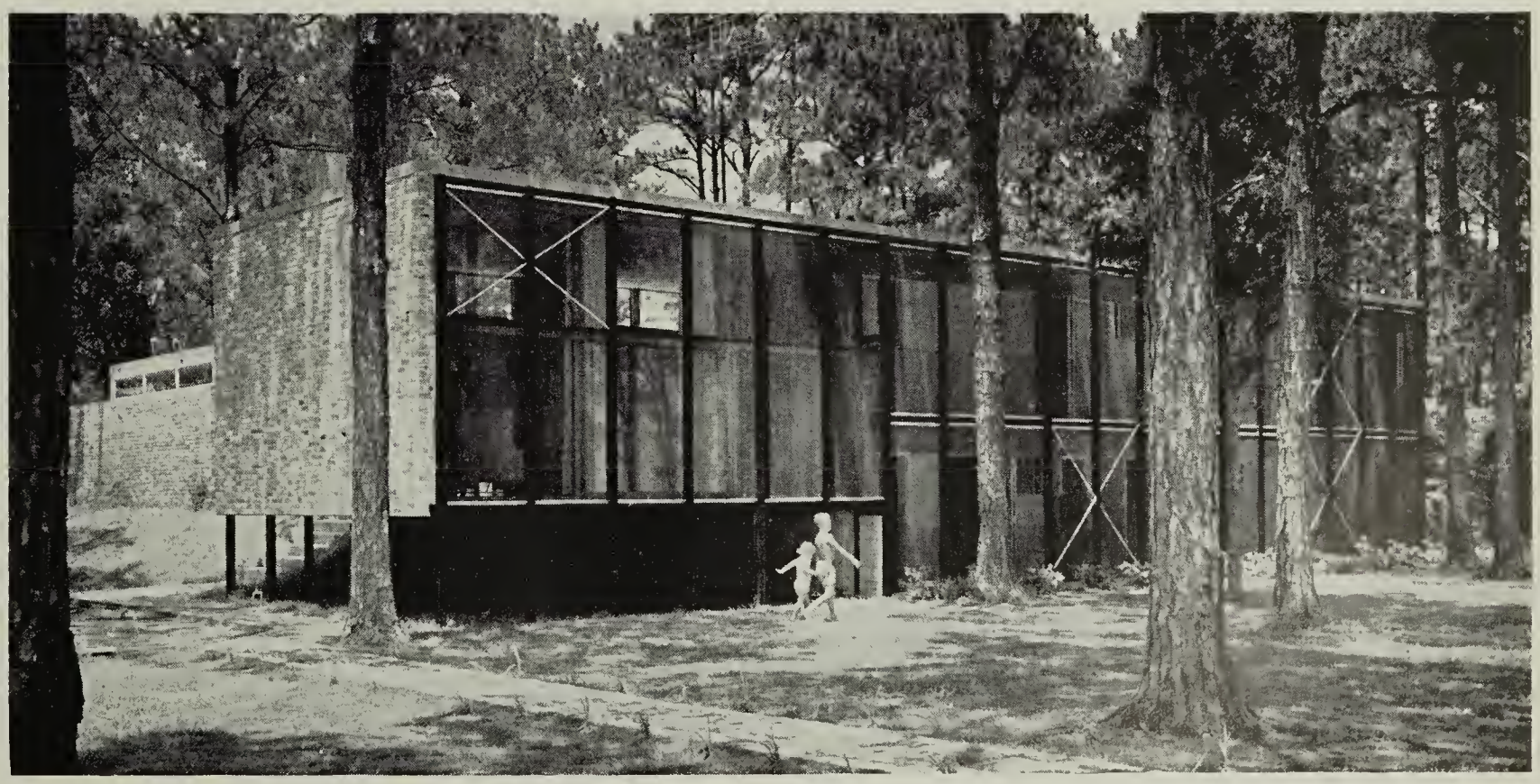
It is worth noticing that more and more good contemporary houses are developing regional characteristics. Slight variances in climate, habits and traditions are being reflected in both plan and overall design. This house was designed for Mr. and Mrs. Ira Harkey, Jr., in the deep South — Pascagoula, Mississippi. High ceilings, galleries, large rooms, long summers and huge colonies of insects form a common heritage. Architects Curtis and Davis have provided a structure that plays up the niceties and thwarts the faults of the area to a remarkable degree. The house has virtually been designed as a screened cage, eliminating most insect control problems. And it was so well planned to trap the breezes, that air conditioning was considered unnecessary.

THE NEIGHBORHOOD: Pascagoula is on the Mississippi Gulf Coast, and is extremely hot in summer, with a light prevailing south and southeast breeze. However, it *does* get quite cold for relatively short periods in winter. The area is not thickly developed, with fairly level land, many large trees, nice beaches for swimming.

THE SITE: facing directly on the beach, the lot is medium sized and dotted with pines. The water is to the south, making it the ideal orientation for all major living and sleeping quarters. Such an exposure, however also necessitated means of privacy from the beach.

Curtis and Davis, Architects-Engineers. Otis W. Sharp & Son, Contractor.

Geometric regularity, lightness and airiness belie the size of this large southern house, adapt it ideally to the Gulf Coast climate. Screening is stretched between steel columns all around house for insect control



ULRICH MEISEL

THE FAMILY: the Harkeys have six children — two girls and four boys, ranging in age from 16 to 3. Mr. Harkey is a newspaper editor with a large collection of books and manuscripts. The major requirements included separate bedrooms, with direct access to a bath, for parents and each child, and a living room which is used solely for adult entertainment, with separate living-play room for the children. And, of course, the enormous amount of storage that such a large family requires.

THE HOUSE: the plan was worked out on three levels, effectively dividing the house into activity zones. The entrance, and central level includes service, formal living and dining areas, and a breakfast room for everyday dining. The kitchen has adequate facilities to prepare for at least twelve. A half flight above this are parents' and girls' bedrooms and a study. The lower level surrounds a patio and includes boys' bedrooms and the play room, with access to a future swimming pool.

There is provision for cross ventilation in every part of the house. Closets in the bedroom wing are suspended to allow light and air from floor-level windows to circulate through the spaces. Sliding glass walls are set back from the screen panels to form long galleries, and aid in sun control. Elevation of the living room floor, and the screens, give considerable privacy from the beach.

Materials are all fire-resistant: small steel columns, floors and roofs of pre-cast concrete planks, partitions of plywood, concrete block or brick. All cut maintenance costs to a minimum.

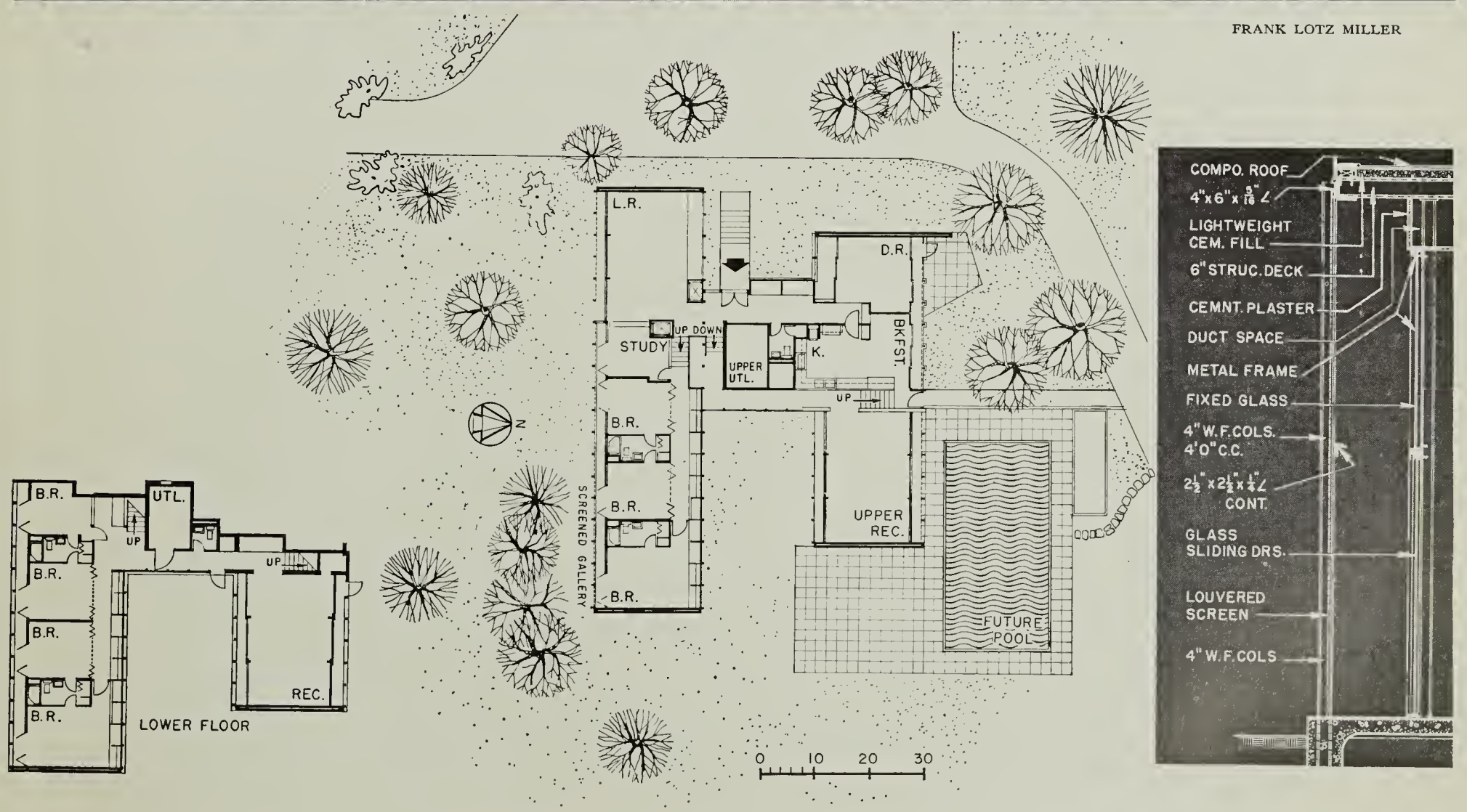
THE ARCHITECTS: Curtis and Davis state, "Ducts are sized for air conditioning, but the openness of the building indicates no need."

OWNERS' REACTION: "The home is ideal for the Gulf Coast, six children."

The Harkey house has a beautiful view of the Gulf. Glare is tempered by screens composed of thin metal slats, which give full vision, cut out direct sun. Colored panel inserts provide spirited decoration to inner play court. Plan permits children to enter home, eat, sleep and play, without having to enter grownup areas

ULRICH MEISEL

FRANK LOTZ MILLER



STEEL AND CORK

THIS thoroughly modern structure is a very successful addition to an old farm house built in 1893. By the simple design device of recalling the roof lines of the original building in the tent-like shape of the new wing, Architect Truett H. Coston has created a very compatible and contemporary-appearing ensemble to house his own family. The photos here show only the new addition.

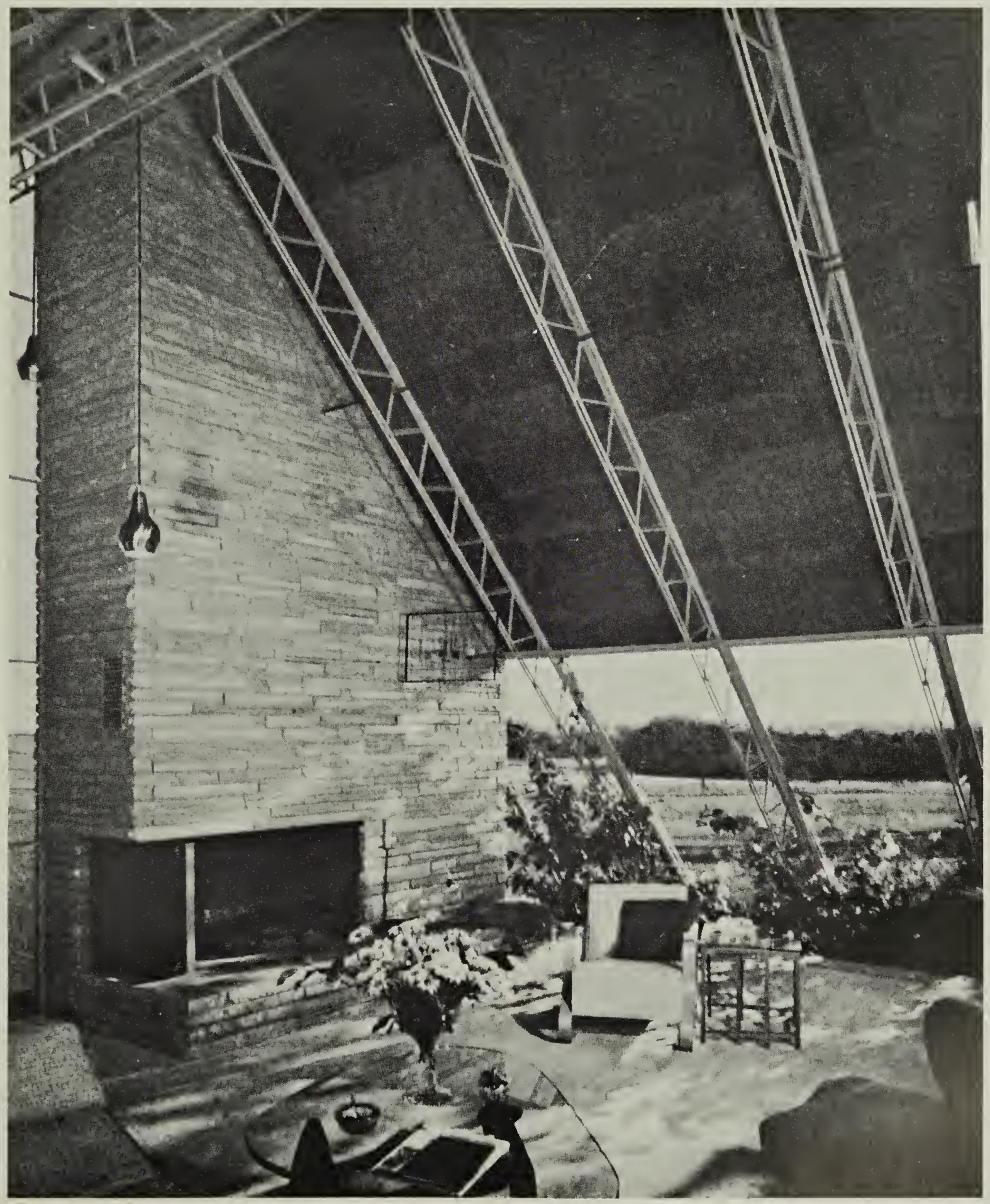
The triangular shape, created by lightweight steel beams, works well. The lower parts of the roof — to ordinary wall height — are glazed to form greenhouse areas. The house is near Oklahoma City, Oklahoma, and high winds and unpredictable weather in the area make outside gardening a bit hazardous.

All beams are left exposed, and painted red to form a decorative relief to the dramatic, cork-surfaced ceiling. The cork is two inches thick, makes good thermal and acoustical insulation. Floors are concrete slabs, foundations are concrete grade beams on drilled footings. Stone, brick and redwood are used as exterior and interior finishes on the addition.

Light, steel-framed covered walks and a carport further tie the new wing to the design of the older structure (photo, left).

Coston-Frankfort-Short were Architectural Engineers for the addition. Smiser Construction Company was General Contractor.

NCLOSE A TENT-SHAPED ADDITION



JULIUS SHULMAN

HOUSE AND HOME

Steel predominates in the entrance area. Roof decking turns vertically for garden wall; open web beams are supported by steel T posts. Entire roof weighs only 1½ tons, requires little maintenance.

Steel vs. wood: how much change

A. QUINCY JONES, architect
J. L. EICHLER, teammate builder
MAXON CONSTRUCTION CO.,
Research Village builder for USG

The unique uses of steel in the Quincy Jones house left many visitors startled.

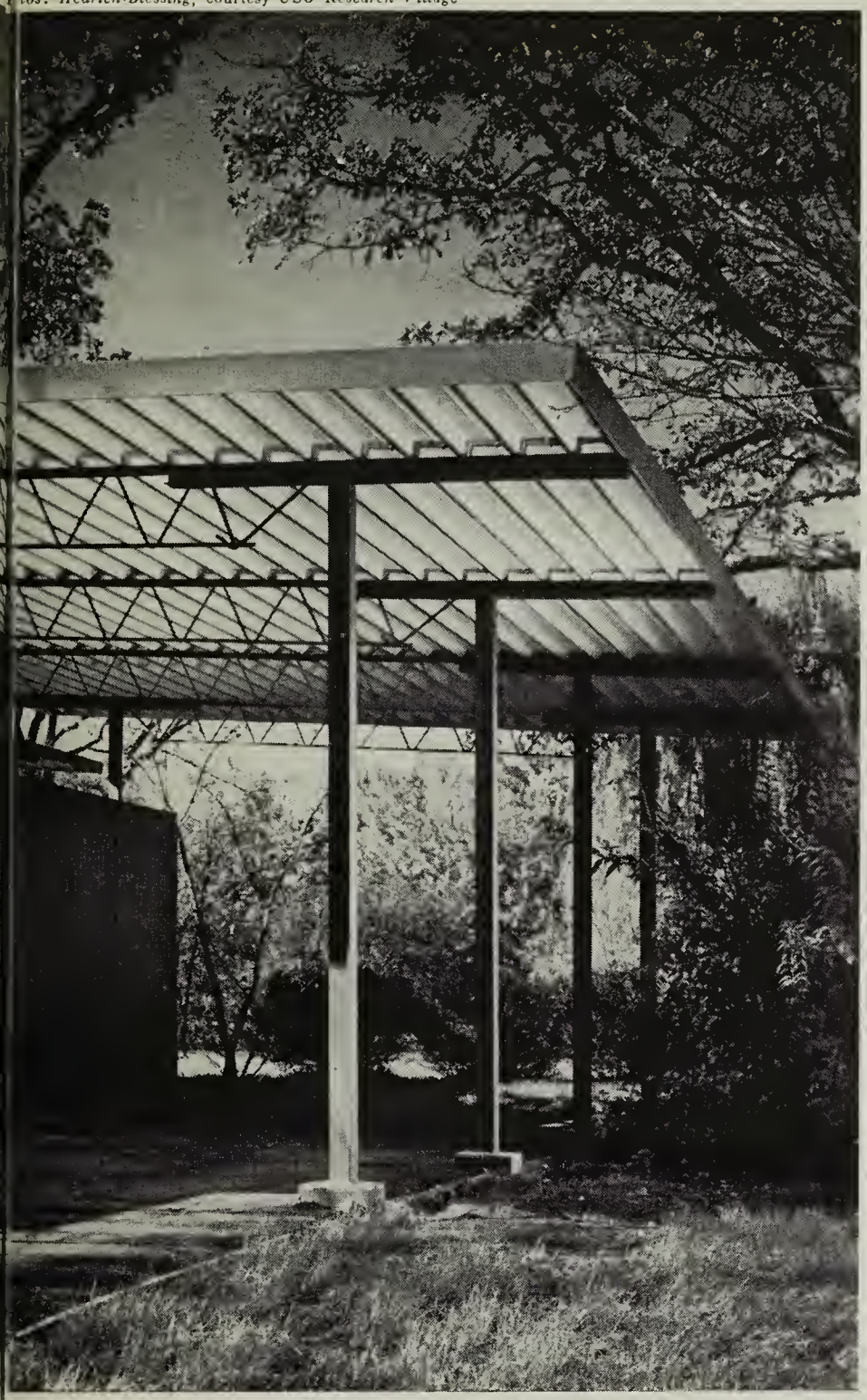
Some people had seen it used like this in factories; others in schools. But few of them had seen it used in a house. Some people were delighted with the light tracery of the construction, others were disturbed by the unfamiliarity.

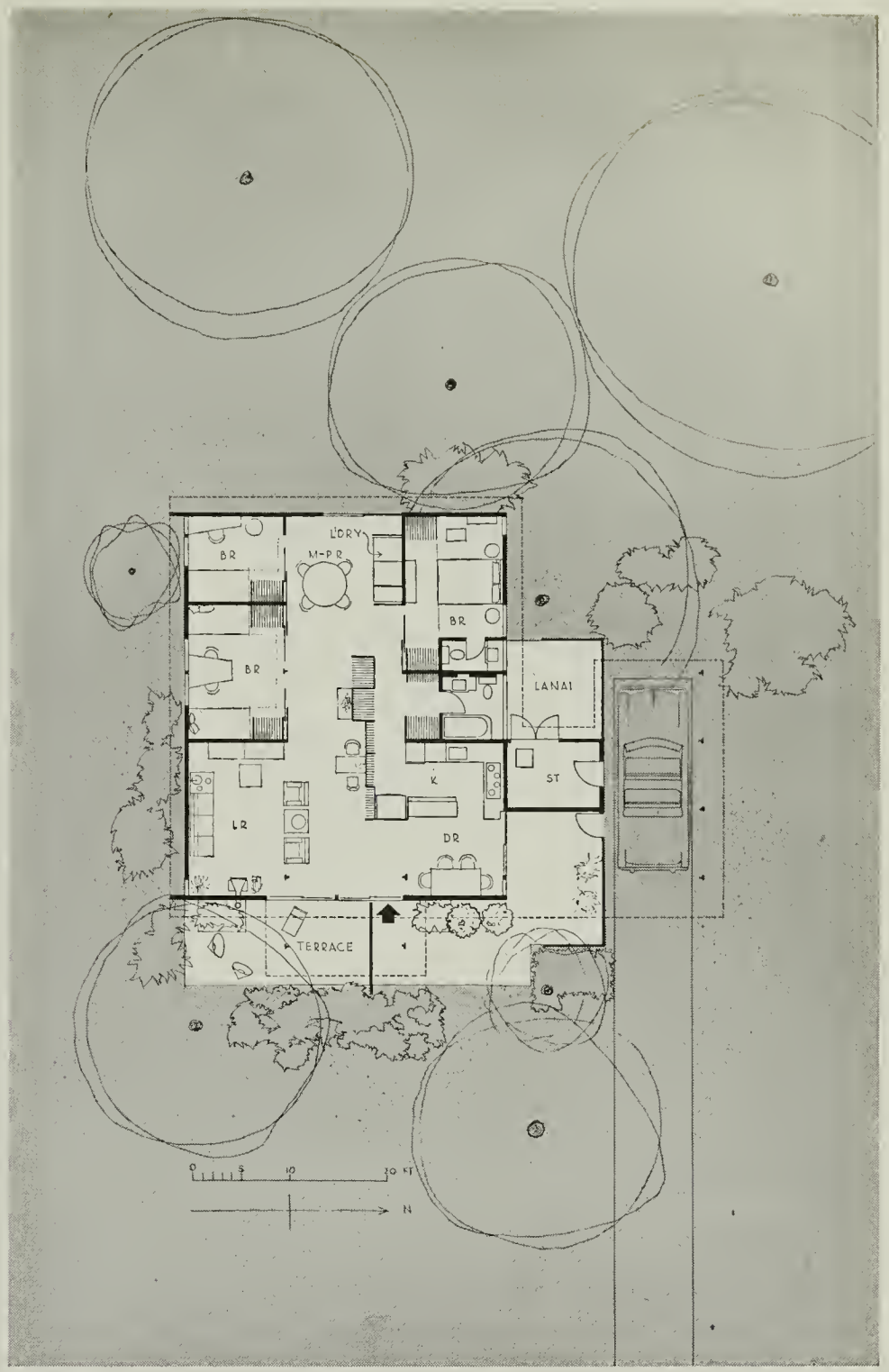
But builders saw something else; an experiment full of new ideas, some of them suitable for immediate use.

The house is fireproof and quickly put up. It resists termites and requires little maintenance. And it should last a long time.

The cost interested builders most. USG claimed that in production the house could be reproduced for less than conventional frame methods.

Photos: Hedrich-Blessing, courtesy USG Research Village



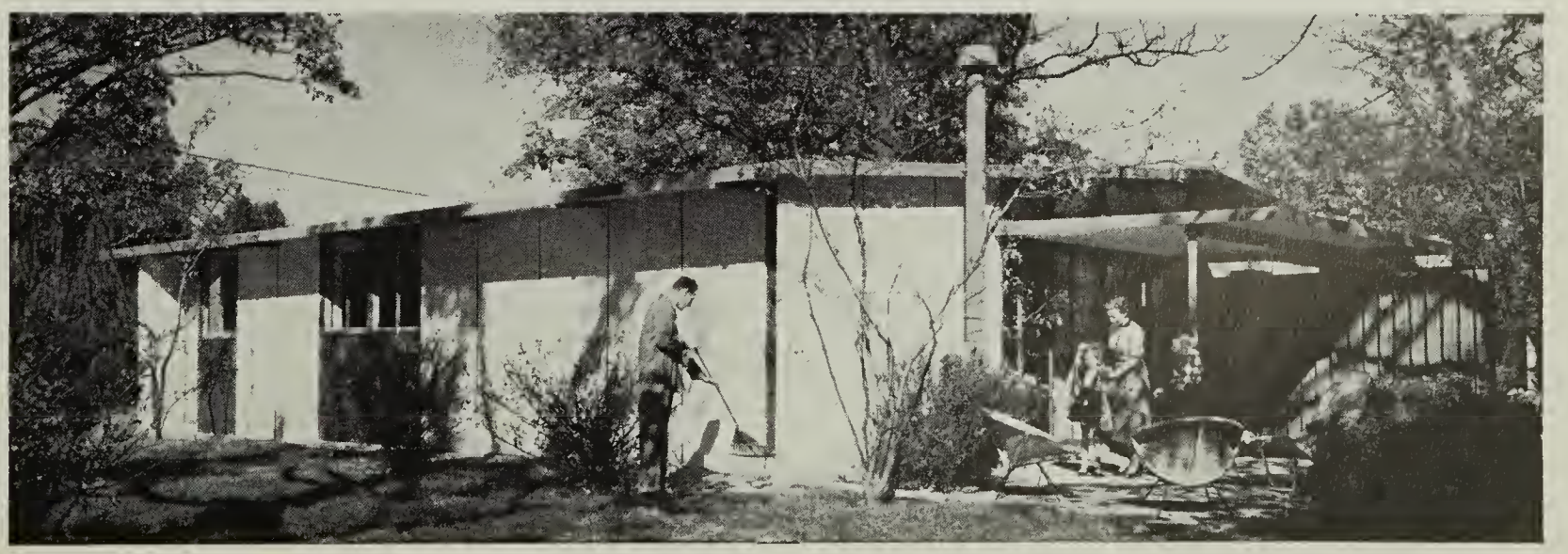


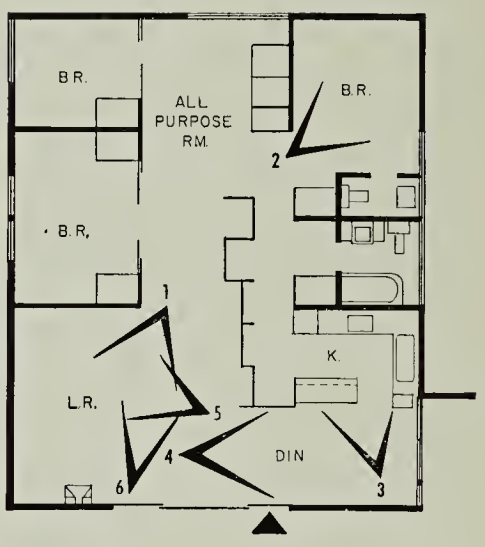
Open plan allows bedrooms little privacy. All-purpose room is usual center hall, made broader. The interior is very flexible, as the partitions and storage wall are nonload bearing. (Laundry location has been questioned since it requires noiseless equipment, extra plumbing.)

will people take?

continued on next page

Plaster panels (shown below at living-room corner) are divided by metal expansion joints



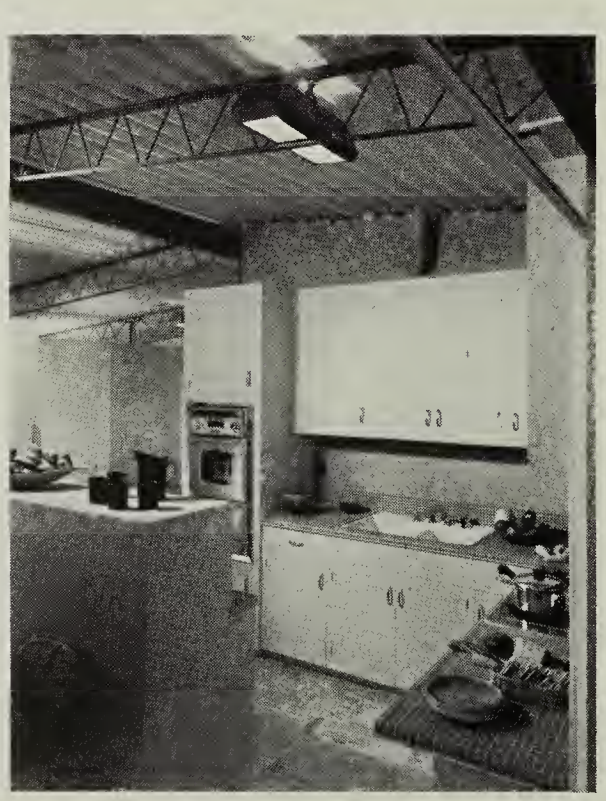


Acoustics are improved by corrugations in ceiling. Some consumers thought dust, cobwebs, would be problem with open-web beams.

Exposed materials create

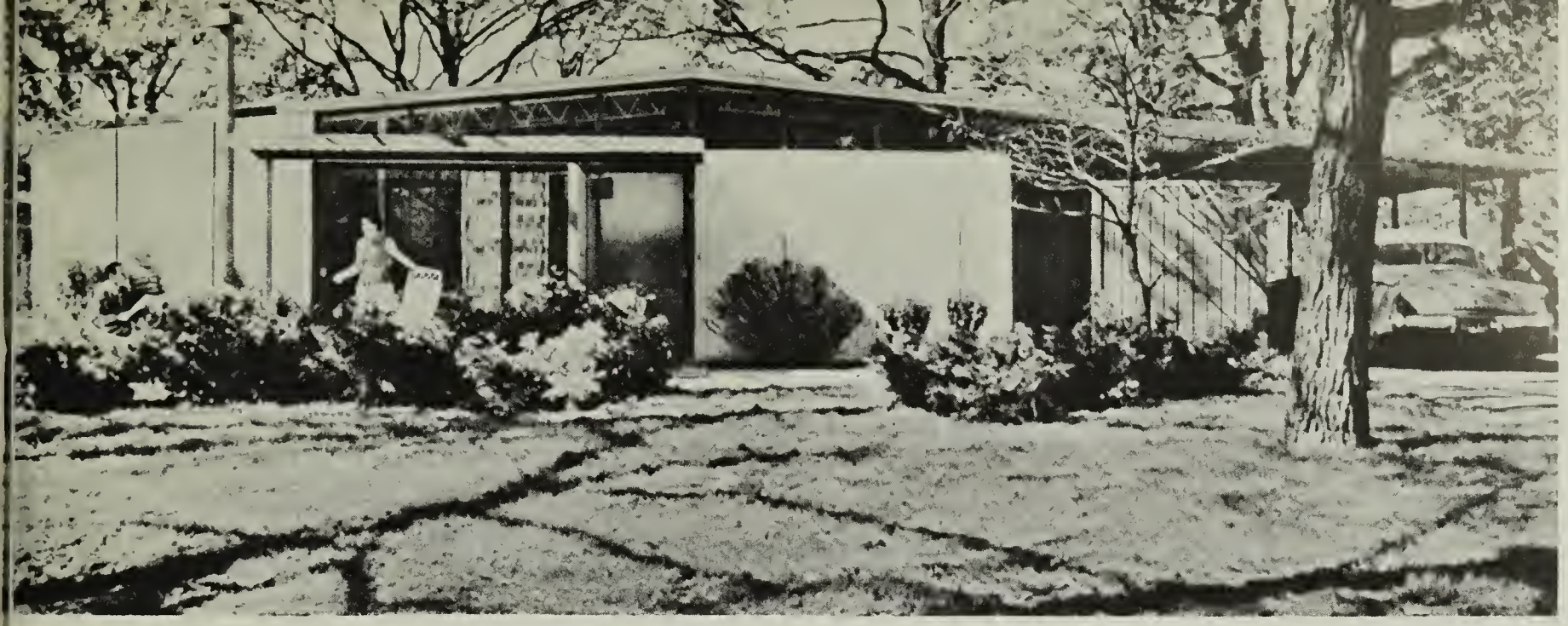
Photos: Hedrich-Blessing, courtesy USG Research Village

High windows in bedrooms provide diffused light with complete privacy, are low enough to allow owners to see out. Proximity of bedrooms to laundry and all-purpose room bothered some visitors.



Mechanical core includes neat kitchen, full and half-bath beyond. Boiler (for radiant heat) and electric service panel are in enclosed storage room outside of kitchen.

Roof cantilevers over gable end are supported by interior steel T columns, shown here in dining area. Steel purlins exist only in front half of house.



Design is on a 7′ module, determined by the allowable span of the 20-ga. roof decking. Since the roof is carried on steel T's on the modules, all walls, interior and exterior, are nonload bearing, allowing architect to place windows freely. Earlier scheme had flat roof (more suitable to materials and technique used), which would probably look even better.

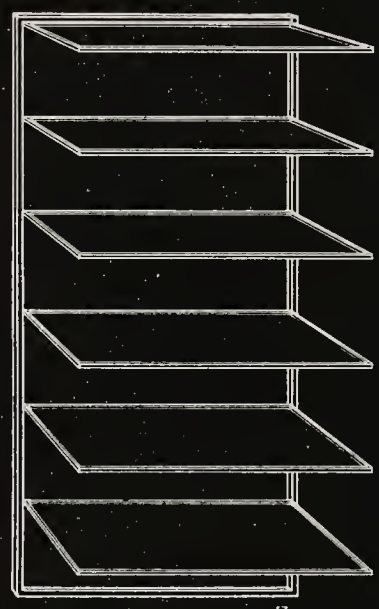
Lively interior view illustrates open feeling of house. The ceiling lamps were specially made. Free-standing storage wall at right is important feature of design. It holds, in various sections, the refrigerator, pots and pans, linen, and coats, could be moved to form entirely new room arrangement.

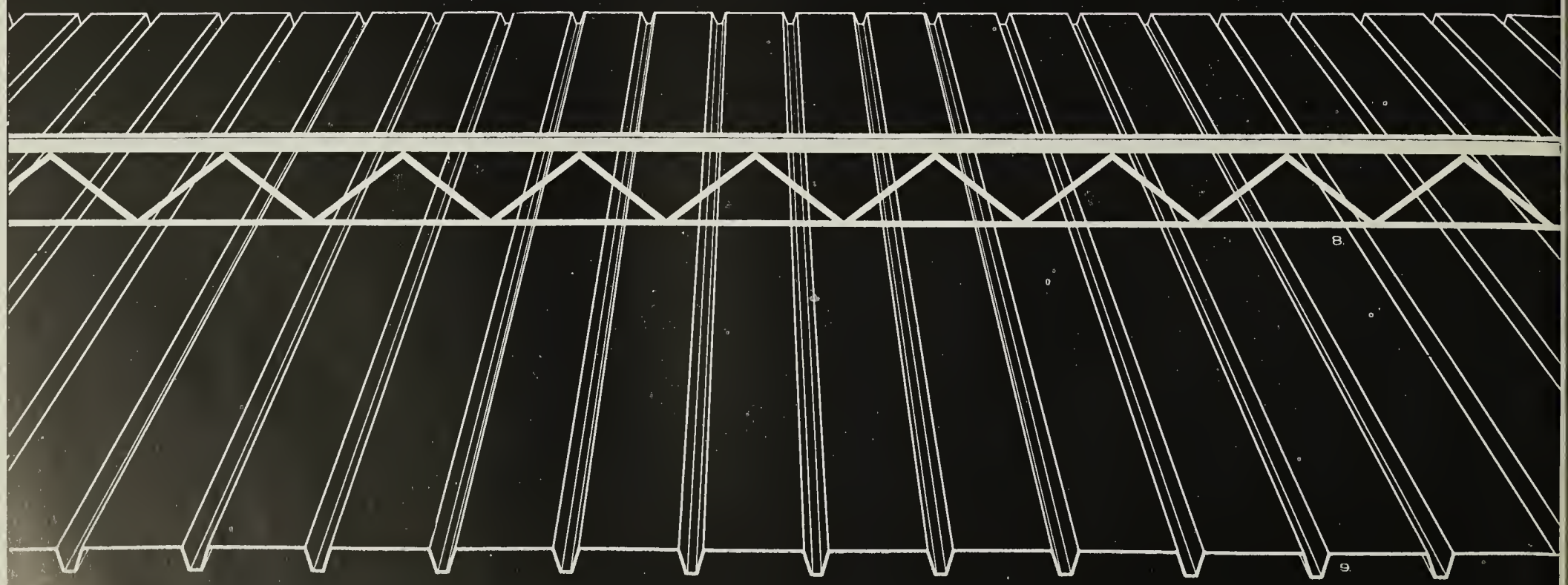
a striking interior

Furnishings and interior colors (in each house) were selected by a well-known decorator working with the architect. Houses are unoccupied, will be sold later in year.

HOUSE AND HOME

WITH STEEL COMPONENTS LIKE THESE





YOU CAN BUILD A HOUSE

THERE's really nothing new about using steel in houses—or is there?

Certainly there's nothing new about an occasional I-beam in the basement, or a steel window, or a steel door frame. There's nothing *very* new about a steel roof truss, or steel-framed sliding glass doors, or light steel joists and studs. People have been using *some* steel in *some* places for a good, long time.

But they haven't been using it as a material in its own right. They've been turning to steel where wood wasn't quite strong enough. They've been using it as a second-choice material, a stand-by to call upon if and when wood gave trouble.

And because they've always looked at bits and pieces of steel, a lot of people have missed one of the biggest stories in home building, the story of steel.

What are the advantages of steel?

First, there are the obvious ones—strength, precision, rigidity. Plus greater cost-stability than some traditional materials. But now there are other advantages. *Steel today is not a raw material to be fashioned on the site, but a vast catalogue of reasonably well-coordinated components.* And the truly astonishing fact is that you can now find a completely shop-fabricated steel part for almost any wood part that goes into today's house.

Obviously, not even steel's most fanatical advocates will claim that today's steel components are the answer to every house problem. There are still problems and some of the problems are big (see p. 144).

For instance: if you are planning to build a traditional house, by all means build it in a traditional way—it will probably be much cheaper.* If you are building in areas where condensation and/or rust are serious problems, use steel only if you can be sure of avoiding both. And if you want a lot of structural flexibility and no dimensional standardization, by all means use materials you can easily cut on the job to fit your special conditions.

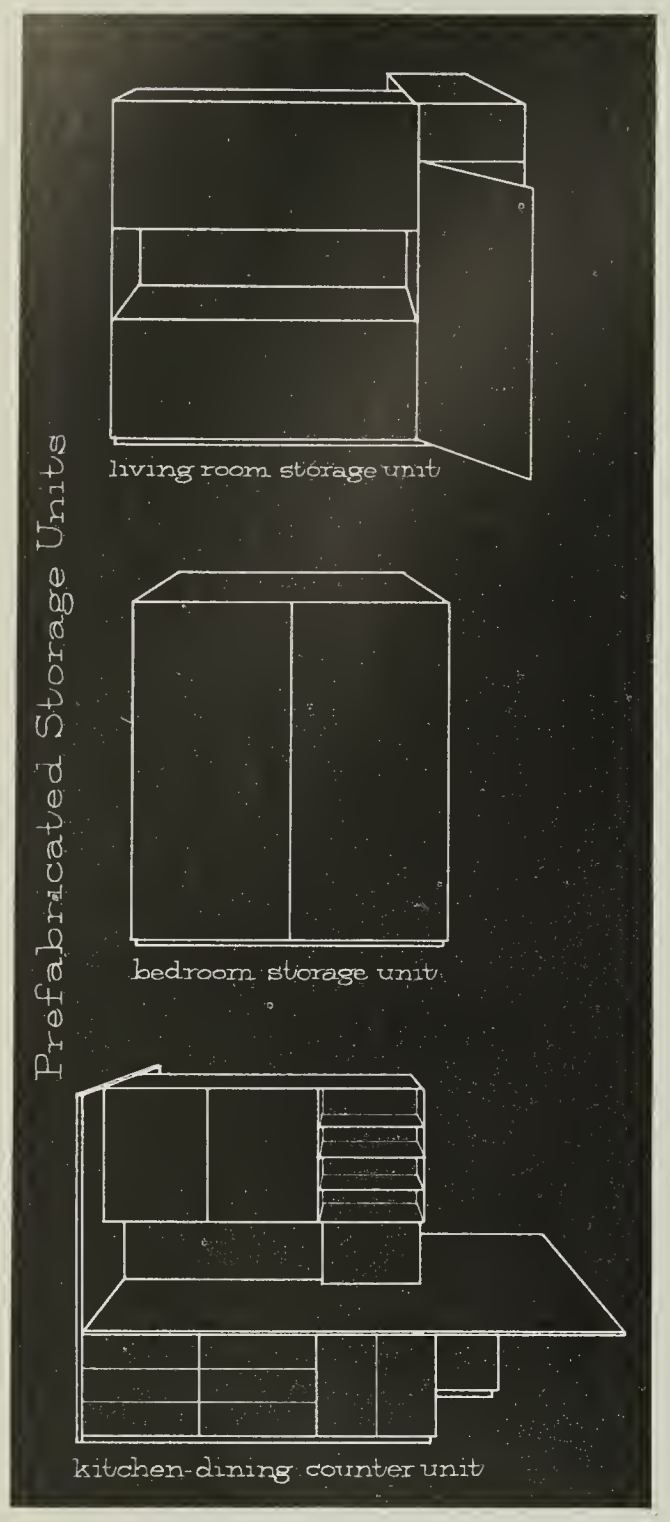
But if you have none of these problems, you might find, as others have, that a steel house may cost no more (and can cost less) than a conventional house. Because a number of builders in Houston, Los Angeles and elsewhere had a hunch that this was (or might soon be) true, they included steel houses in their Parades of Homes this year.

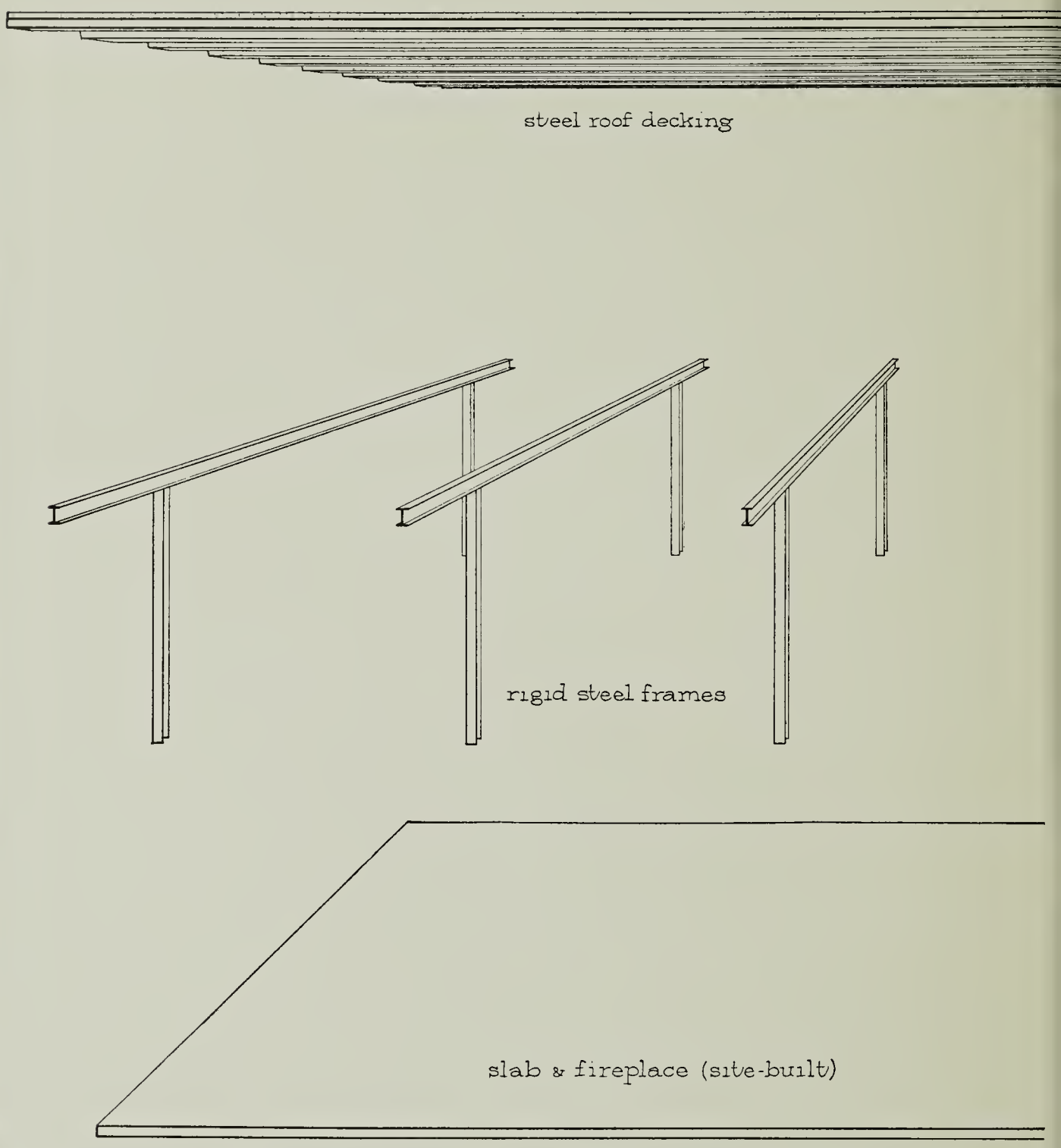
And because production-builder Joseph Eichler had a similar hunch, he commissioned Architect (and steel pioneer) Raphael Soriano to design the first all-steel builder house in the US. Last month the experimental Soriano-Eichler house (below) was open to thousands of visitors from all over the San Francisco Bay.

Ernest Braun

Opposite:
Familiar steel components—
1. roof truss;
2. light joist;
3. nailable stud;
4. wall panel;
5. prehung door;
6. sliding glass doors;
7. window assemblies;
8. open web joist;
9. decking.

* But steel won't commit you to only one type of modern design: the J & B Mfg. Co. of Houston has been building steel-framed ranch-type houses (see June '56 issue and p. 144) and claims they're cheaper to build than wood houses.





BUILDER EICHLER'S NEW EXPERIMENTAL HOUSE IS AN ERECTOR-SET ASSEMBLY

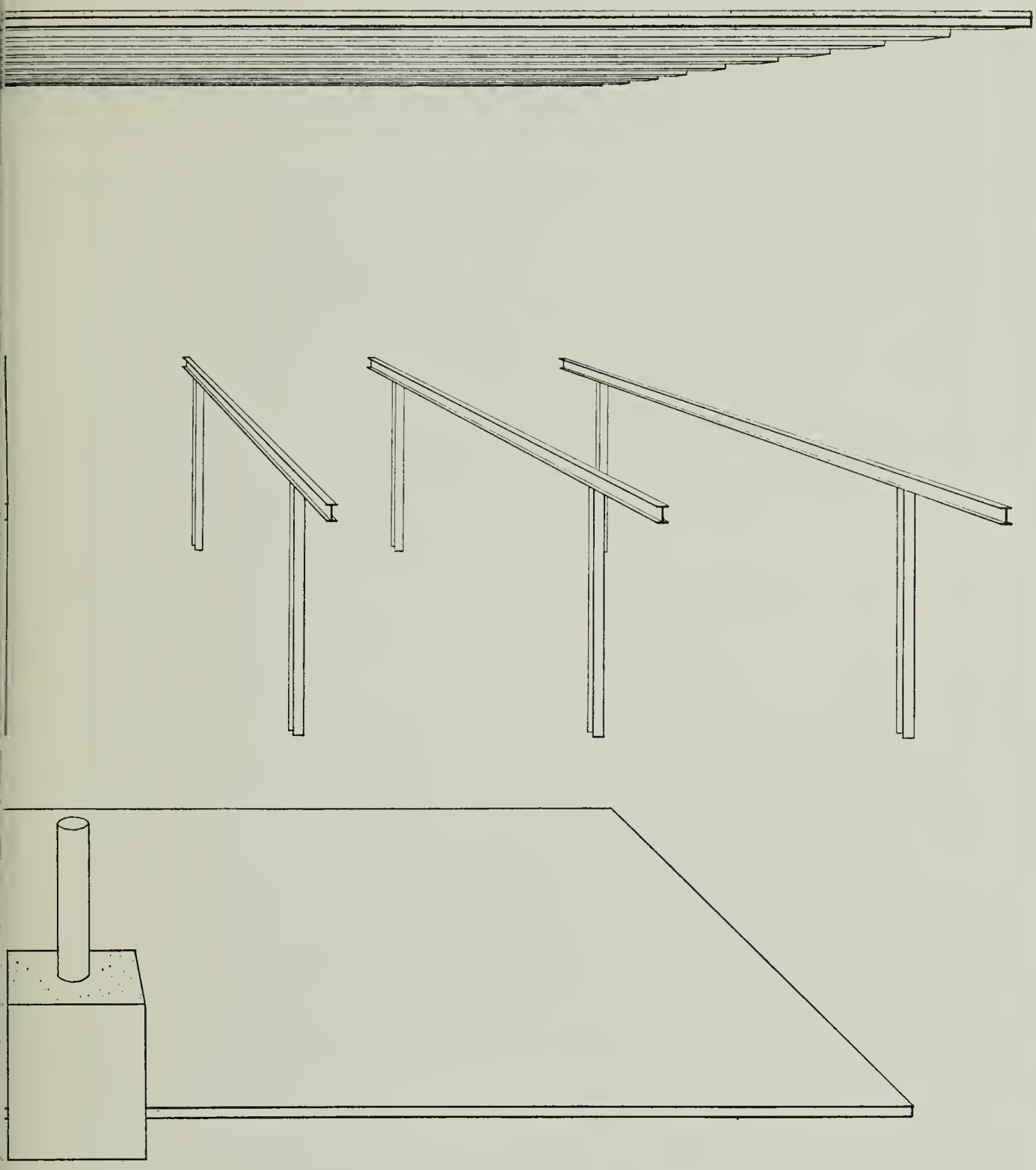
On a 1,560 sq. ft. concrete slab in Palo Alto, Calif., Architect Soriano and Builder Eichler have just erected an assembly of prefabricated steel, glass, plastic and plywood parts that makes most 1955 houses look like Model Ts. And the advanced look of the Soriano-Eichler experiment is not skin-deep: the importance of this house lies in its bone-structure, a new approach to building technology.

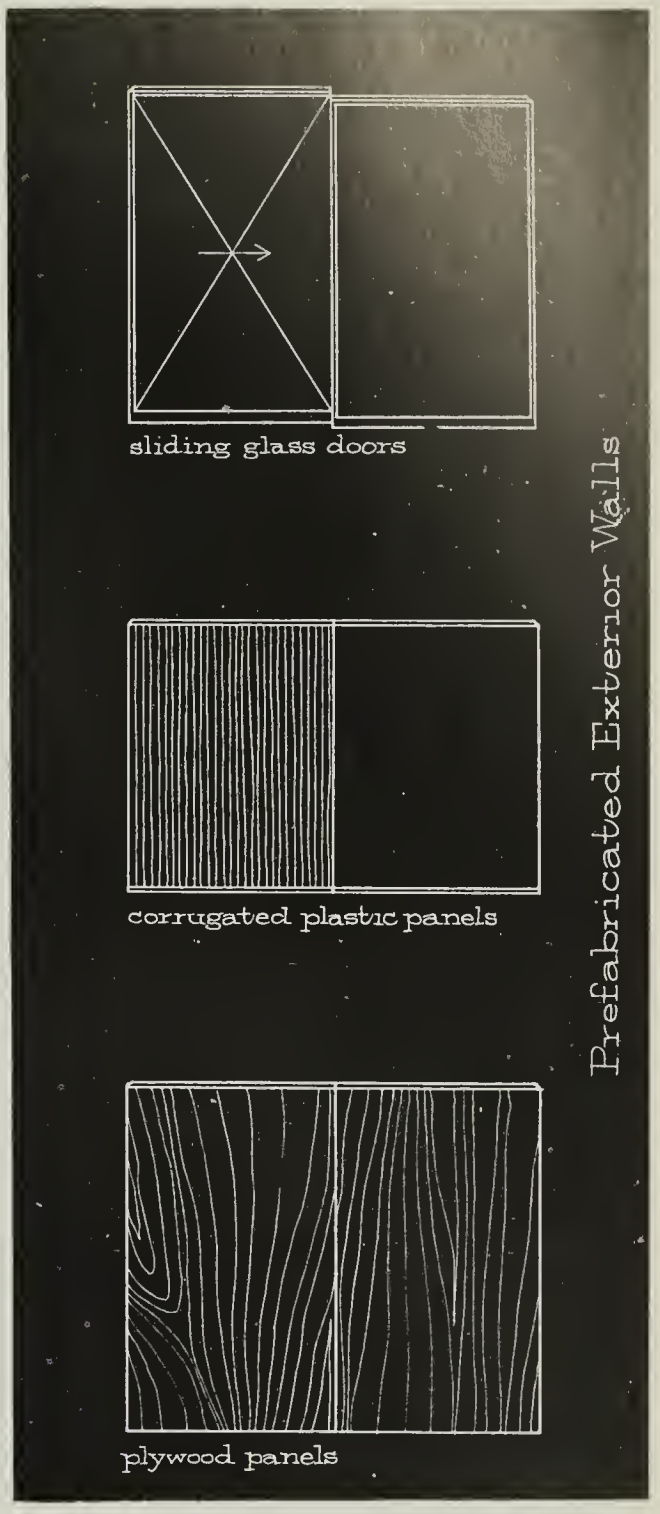
The bone-structure consists, basically, of seven identical, welded, light steel frames spaced 10′ apart. Each frame weighs about 700 lbs. This steel cage is topped off with a fluted steel deck (plus insulation), and closed in with three types of wall panels: a floor-to-ceiling fixed or sliding glass unit; a plywood unit in a steel frame; or a glass fiber-plastic panel.

The interior partitions were similarly prefabricated: all consist of factory-made storage walls that were trucked to the site, then rolled into position on dollies. The only site-fabrication involved some masonry, plumbing and wiring.

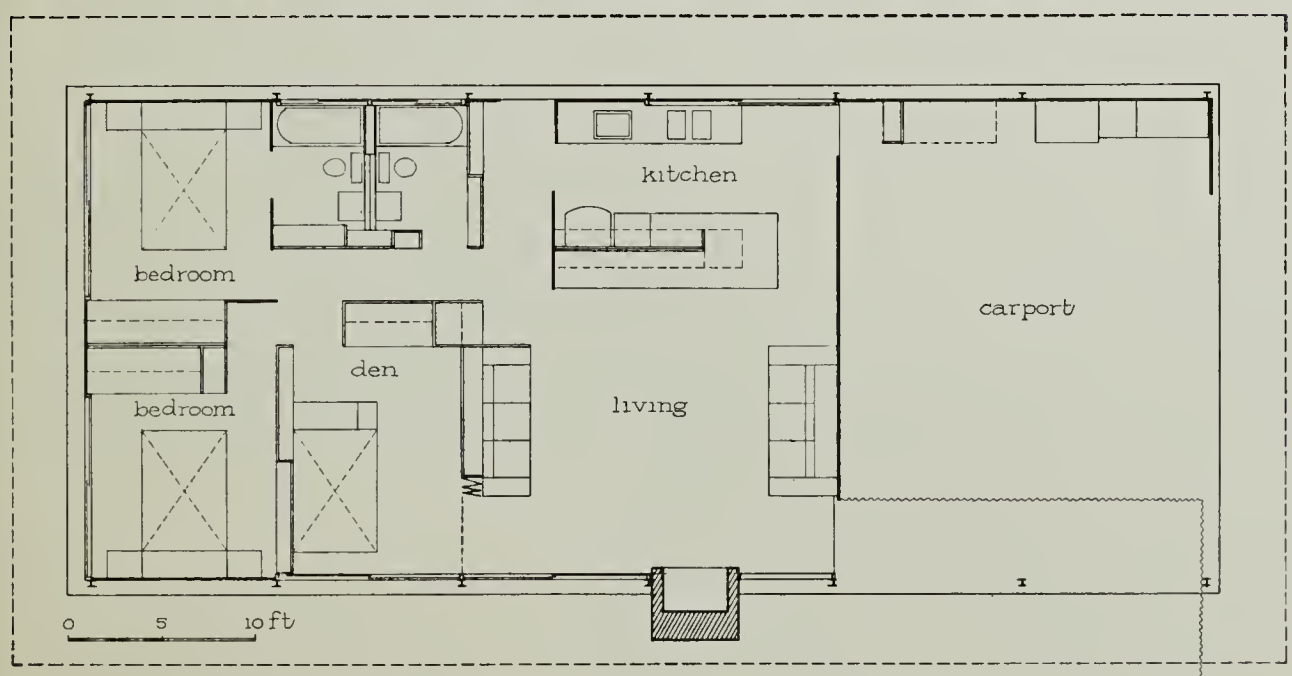
Says Ned Eichler: "In a sense a steel house is the most highly prefabricated house there is, since its parts are processed at the mill and then site assembled."

All first experiments are costly, but this custom-built experiment compares quite favorably with the production houses Eichler builds by the hundreds on neighboring tracts. Architect Soriano took bids on his steel house, found that he could build it for $7 per sq. ft. in lots of 100, *including all the handsome cabinetwork.* Said Soriano: "Two men could erect this house in 2½ days, aided only by a crane."



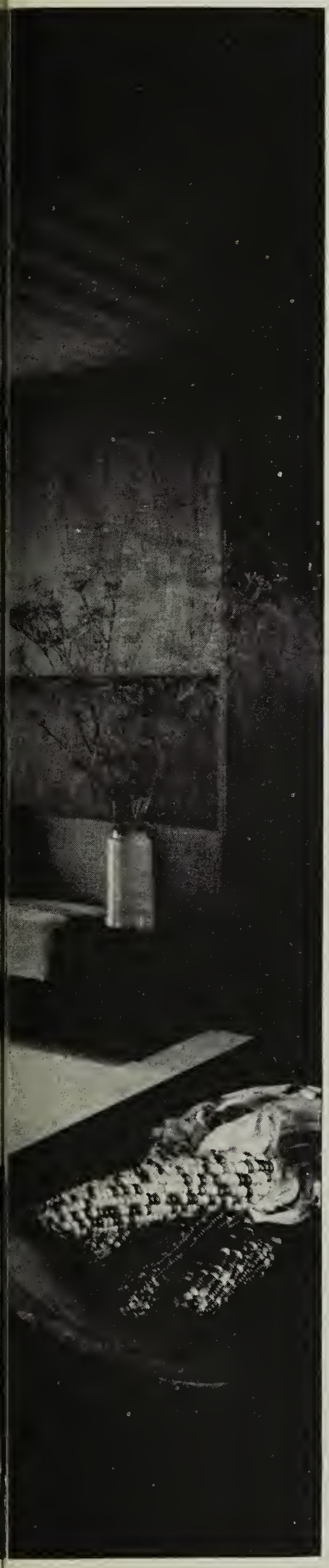


OF STEEL PARTS AND PREFABRICATED WALL UNITS



3-bedroom, 2-bath plan is extremely compact, saves space through elimination of fixed interior partitions. All were replaced by storage walls of veneered plywood.

Wall units are 8′ high, reach up to underside of dropped steel girders. 8″ deep space between girders is filled with glass



Ernest Braun

Because there are no interior structural supports, plan can be adjusted almost at will

ELEGANCE MARKS STEEL HOUSE INTERIORS

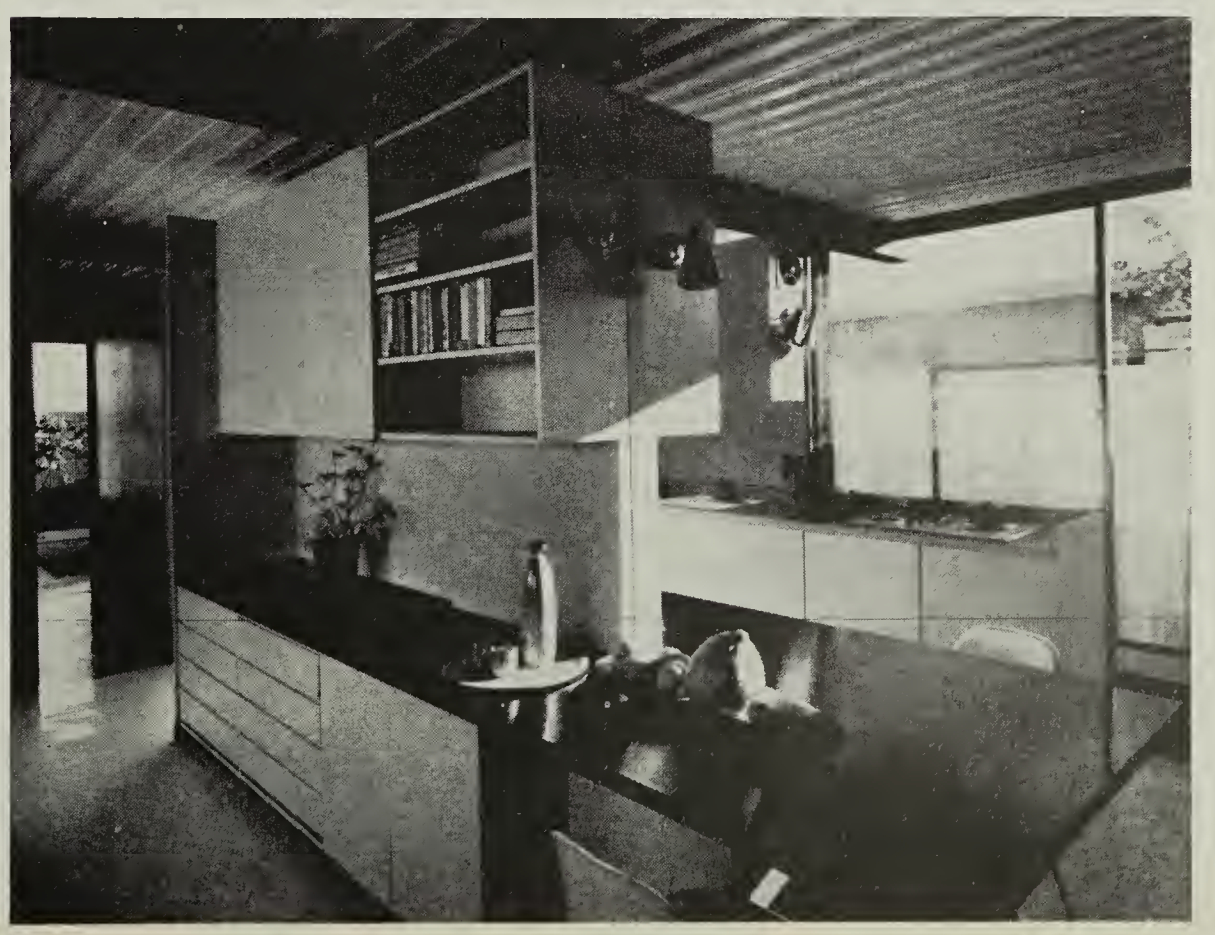
Must steel houses look cold? The Soriano-Eichler house — being an exhibition model—appears unlived-in. Yet even in its present form, this house suggests ways and means of softening an industrialized house through the introduction of warm textures, colors and small-scale patterns.

To keep the house from looking cold, Architect Soriano introduced the grain of wood and the texture and color of fabrics in his prefabricated storage partitions. Elsewhere. Soriano used spots of bright color. as in the lemon-yellow finish of the steel frames around sliding glass units.

Are acoustics a problem in a steel house? Soriano says that this house is "a joy to any hi-fi enthusiast" like himself. One reason: the fluted steel ceiling cuts down reverberation (in addition to supplying another handsome pattern).

Will steel bring a new approach to home building? "Yes," says Soriano. "A complete departure from conventional design thinking is involved. Most previous attempts at steel house construction have imitated conventional wood structures, ignoring the fact that steel is an entirely different medium with a language of its own."

Prefabricated counter-unit separates kitchen from living area, serves also as dining table



THE NEW LANGUAGE OF STEEL

You can build almost any house in a modern material like steel, but steel works particularly well in a modern house. Here is why:

• **Steel makes big spans easy,** and big spans are the *sine qua non* of open plans and large glass walls.

• **Steel has great rigidity,** and rigidity is important in houses with lots of glass because such houses are difficult to brace.

• **Steel allows precision-detailing,** and precision-detailing is highly desirable both in prefabricated houses and in modern site-built houses—for precision-detailing gives much modern architecture its elegant look.

These arguments tend to suggest that the most reasonable solution in steel is a simple rectangular flat-top with walls of glass or other sheet-inserts—i.e., exactly what Soriano and Eichler did in their experimental house (see previous page).

But steel is more flexible than you might think. It is quite true that steel framing tends to produce rectangular cages, but steel roof trusses (like Architect Ned Cole's prefab truss) can be made in any shape or form—and can thus radically change the house silhouette. It is quite true, also, that *exposed* steel framing will tend to give a house a very modular, "Japanese" look, but the truth is that *steel should not be exposed at all* in houses in more than half the US (at least not until problems like permanent rustproofing and condensation have been more convincingly solved)—so that the "skin" of the house can take on whatever color, texture or pattern might seem desirable (left). And it is finally quite true that steel tends to commit you to some sort of modular plan—but, then, isn't that what all home builders are working up to, and haven't they found that modular planning does *not* mean frozen planning?

J & B's steel-framed builder-house (above and below) has a "skin" of wood and brick to make it more palatable to home buyers.

F. W. Seiders

Actually, steel in home building hasn't quite made the grade—yet. One problem: a lot of steel is still scaled to bigger and heavier construction. For example, steel warehouses in cities like New York and Chicago stock light structural steel sections in 60′ lengths—so that if you need it in 28′ lengths, say, you pay for some pretty expensive waste. Elsewhere, jobbers stock shorter lengths (20's, 30's, 40's, 60's and 65's)—and in crazy-quilt Detroit they stock steel in 31′, 33′, 42′ and 47′ lengths.

These stock lengths all have one thing in common: they disregard the dimensional standards rapidly being developed by the home building industry—see April, '55 H&H. It is true, of course, that manufacturers of open-web joists and steel studs have long scaled their products to the dimensions of the house—and this has paid off handsomely. But the manufacturers of light, hot-rolled structural steel sections still have to follow suit.

The same thing holds true for some manufacturers of sliding glass doors, prehung door assemblies and sliding closet doors. Many of these components are beautifully made and reasonably priced; yet few bear any relation to the dimensional standards being developed in home-building.

These are not minor problems: anybody can saw off a 2″ x 10″ on the job, but a saw wouldn't make much of a dent on a 6″ Junior I-Beam. By its very nature, the steel house of tomorrow will have to be largely shop-fabricated.

As for today, steel houses are still in the experimental stage—but the experiments are multiplying fast and furiously all over the US. Here, on the next four pages, are some of the most exciting recent experiments in steel: custom houses now, perhaps production houses tomorrow.

Photos: Julius Shulman

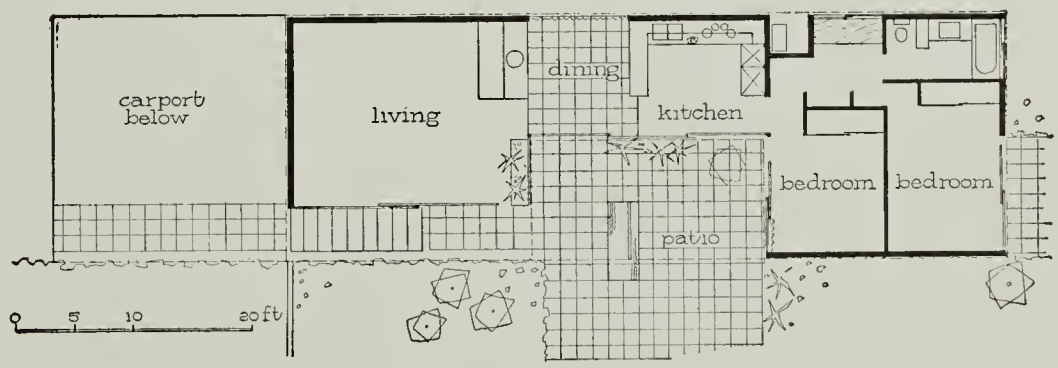
Steel-framed patio house is set on a concrete slab base, has lower-level carport facing street.

STEEL HOUSES NEED NOT LOOK COLD

In this glamorous little 2-bedroom house, Designer Pierre Koenig has shown a way to domesticate steel.

Structurally, this house is very similar to the Soriano-Eichler experiment: a light steel frame, roof decks and some walls of fluted steel panels, other walls of sliding or fixed glass, and a few touches of plastic, mahogany plywood and masonry. Result: a very attractive and livable structure, planned around a small central patio. Profuse planting contrasts pleasantly with the precise lines of the house.

Like the Soriano-Eichler house, the Koenig house (though a custom job) consists of prefabricated components assembled on a slab. Cost: less than $12,000.



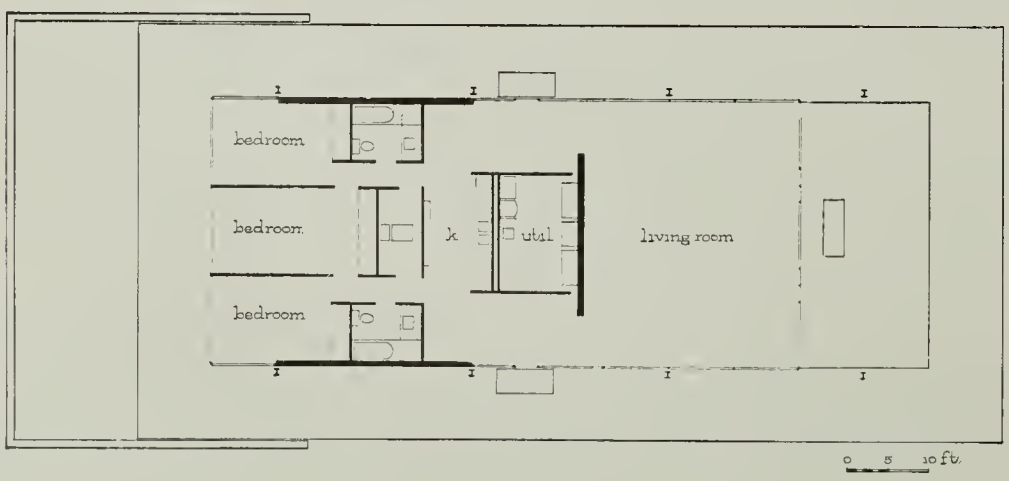
PIERRE KOENIG, designer
WILLIAM PORUSH, consulting engineer
LOCATION: Los Angeles, Calif.

Detail-photos show simple, repetitive rhythm of steel frame. Bays are 10′ x 20′, spanned only by steel decking.

Photos: Ulric Meisel

Big covered porch (16′ wide and 32′ long) is an outdoor extension of the living room.

HEAVY STEEL IN RIGID FRAMES CAN SPAN GREAT SPACES



JACQUES C. BROWNSON, architect

LOCATION: Geneva, Ill.

The four monumental rigid frames of steel that span this extraordinary glass house were too large to be shipped in one piece from the fabricator.

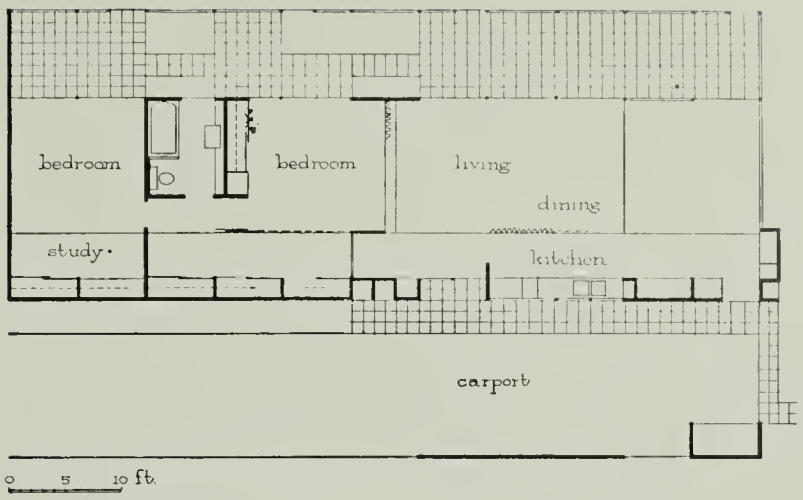
Even so, all connections were made ready in the shop for easy assembly on the site and four men (two of them amateurs), aided only by a crane, were able to erect and weld all the frames in 1½ days. The frames weighed some 3,000 lbs. each.

Architect Jacques Brownson, who designed and built this house for his own use, suspended the roof plane from the rigid frames, thus left the whole interior space free of columns and the whole ceiling free of dropped beams. Result: a completely open and flexible plan, utterly divorced from the structural cage.

However "special," this house is a dramatic demonstration of the great strength (both in tension and in compression) of this precise material.

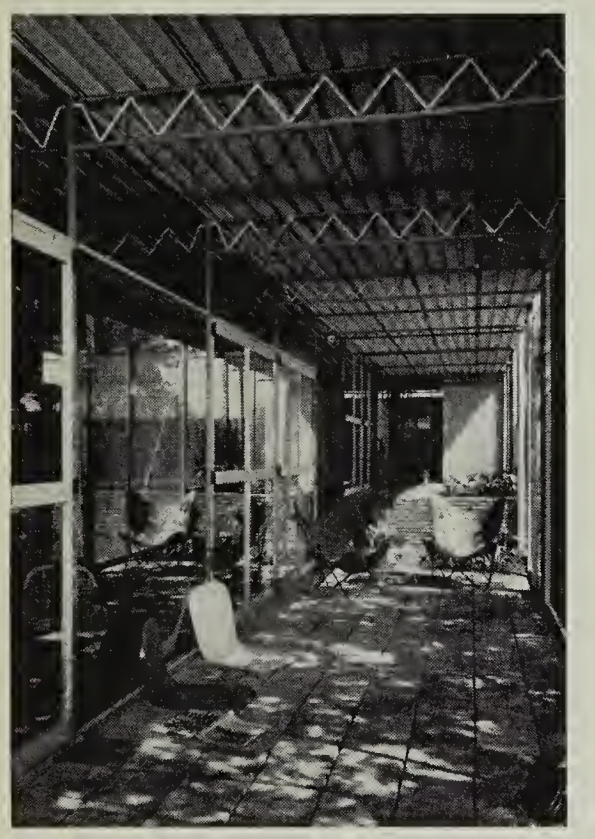
COCKE, BOWMAN & YORK, architects
W. B. UHLHORN, general contractor
LOCATION: Harlingen, Tex.

6′-3″ wide bays create small, domestic scale



LIGHT STEEL FRAMING

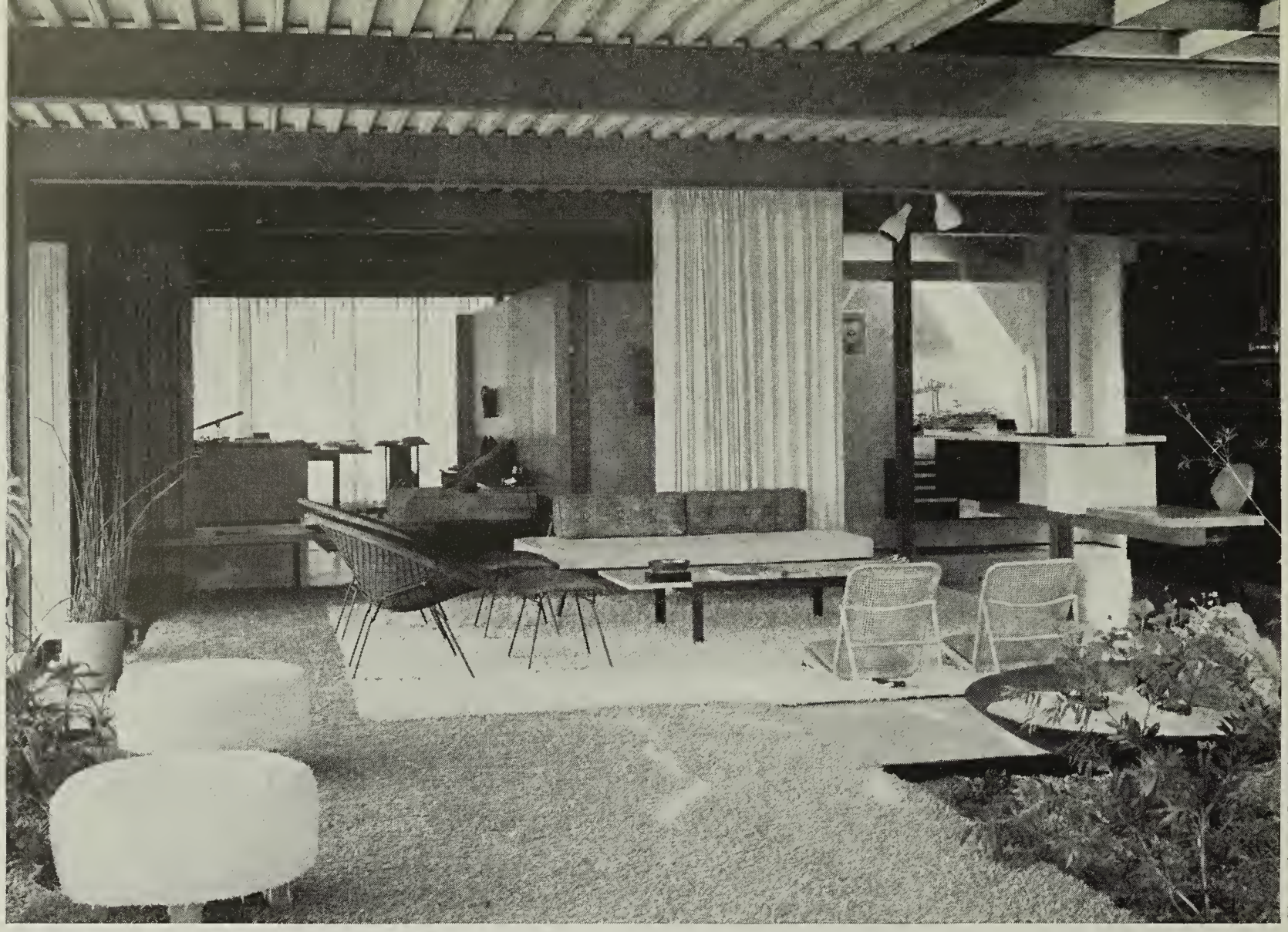
INTRODUCES NEW DECORATIVE PATTERNS



Screened porch 8′ wide, runs down entire east side of house. Right: living-dining area.

Where the Brownson House (opposite) uses heavy steel in monumental frames, this house built by Architect John York for himself, shows steel scaled down to domestic dimensions. Both approaches are valid, but York's is likely to be less expensive and more readily acceptable to those who like more intimate houses. The comparison suggests some of the changes steel will have to undergo to compete successfully in home building: not only recognition of the dimensional standards developed by the home building industry, but also acceptance of a more domestic scale.

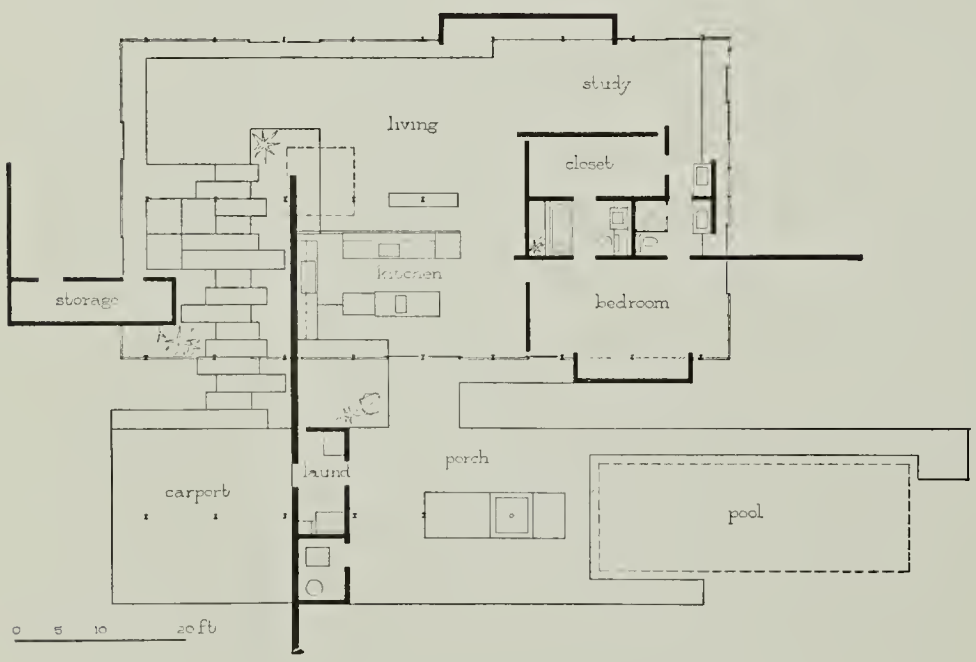
This steel house is supported entirely on 1¼″ diam. pipe columns which carry bar joists specially made out of 1″ pipe and ½″ reinforcing rods. The supporting structure in turn is topped off with steel decking and closed in with glass, screening and sheets of asbestos. Result: a graceful house, reminiscent of the glass-and-iron tracery of the Victorian era.



Photos: (opp.) Ernest Braun

Open plan measures 40′ x 72′, is subdivided only with screens, curtains, sliding walls. Steel columns are hardly visible

STEEL FRAMING OPENS UP THE HOUSE PLAN



A. QUINCY JONES & FREDERICK E. EMMONS, architects
LOCATION: West Los Angeles, Calif.

Architect Quincy Jones' own new house is sheltered under a 3,000 sq. ft. roof, and that roof is supported on less than 3 sq. ft. of column area. To put it another way: his house plan is literally 99.9% open, free and unobstructed.

This amazing ratio of floor area to load-bearing structure is today economically feasible in steel framing. It is true that Jones could have spanned his 40′ house-depth with a triangular wooden roof truss. But with such a roof it would have been difficult to bring light into the center of his big house through two big skylights. He had no trouble doing this with a flat roof.

It is also true that Jones might have used a wooden post-beam-plank system to achieve a very similar effect, but such a system would have required considerable cross-bracing. This, in turn, might have meant elimination of glass walls and "freezing" of some partitions to coincide with column lines.

Jones used the right material—steel—to achieve the kind of house he wanted—open, glassy, and flexible. In doing so, he demonstrated the advantages of both structure and plan./END

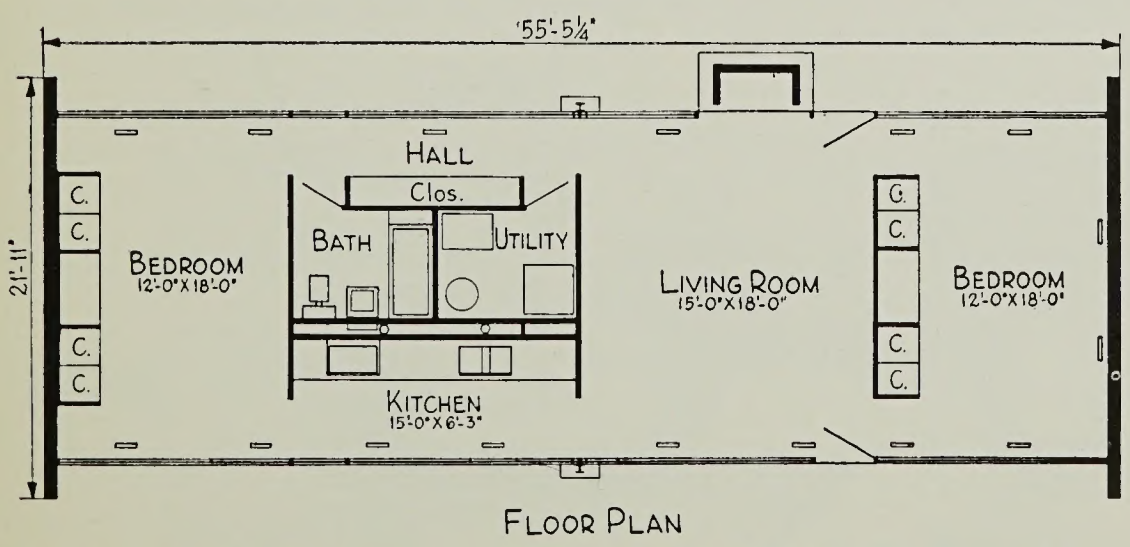
AMERICAN BUILDER

Will steel for FRAMING give wood a run for the money?

For steel, these are the big points:

- low unit cost of fabricated steel
- rapid erection time for steel—total of 13 hours for the house shown here
- steel is simple way to free-span interior space

Bid price for the steel frame of this house in Salt Lake City was $1,400, fabricated, erected and including all welding and grinding



FLOOR PLAN

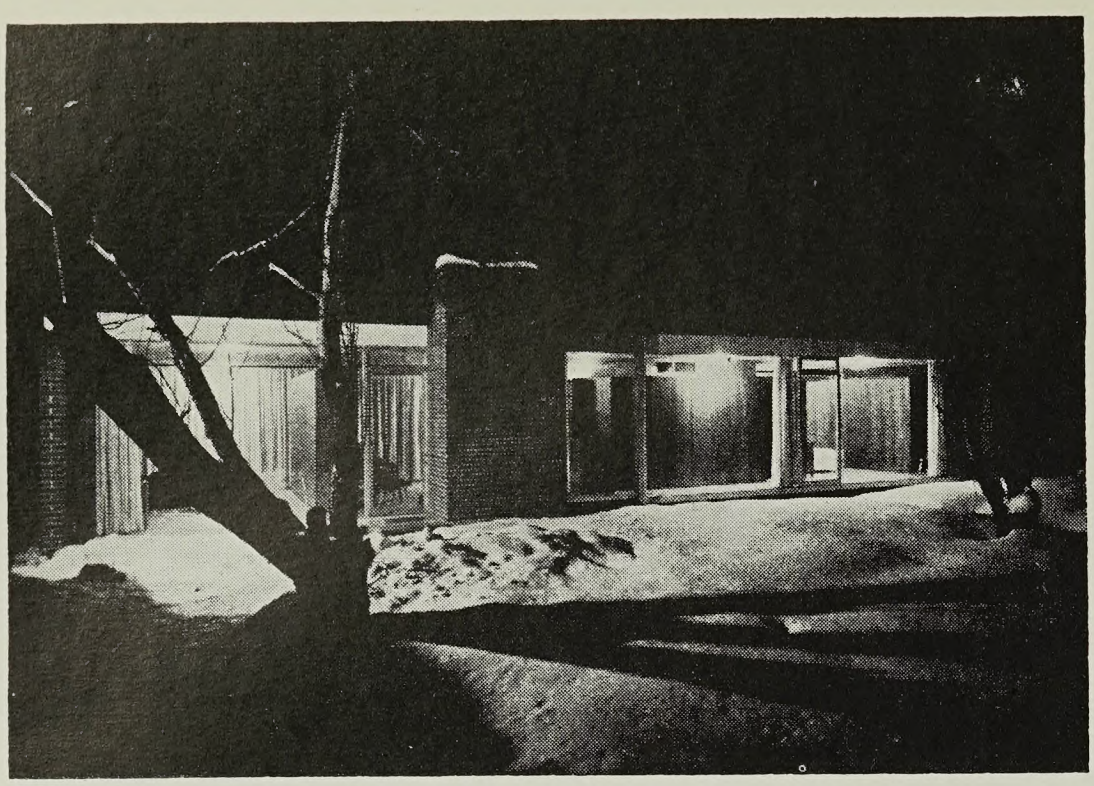
Colored concrete floor is scored into squares and ground very smooth. Perimeter heating ducts in slab

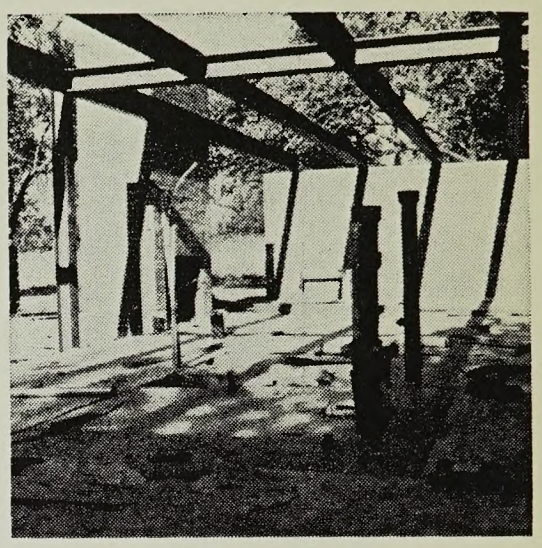
This steel-framed building designed by architect Dean L. Gustavson has 1,000 square feet of living area. Cost was $12,700 including built-in furniture and kitchen equipment but not including the architect's fee and the lot.

The steel framing was erected in five hours, welding and grinding took another eight hours. The building was produced at a cost comparable with wood in the inter-mountain area.

The building is divided into four bays one of which has an interior

(Continued on page 84)



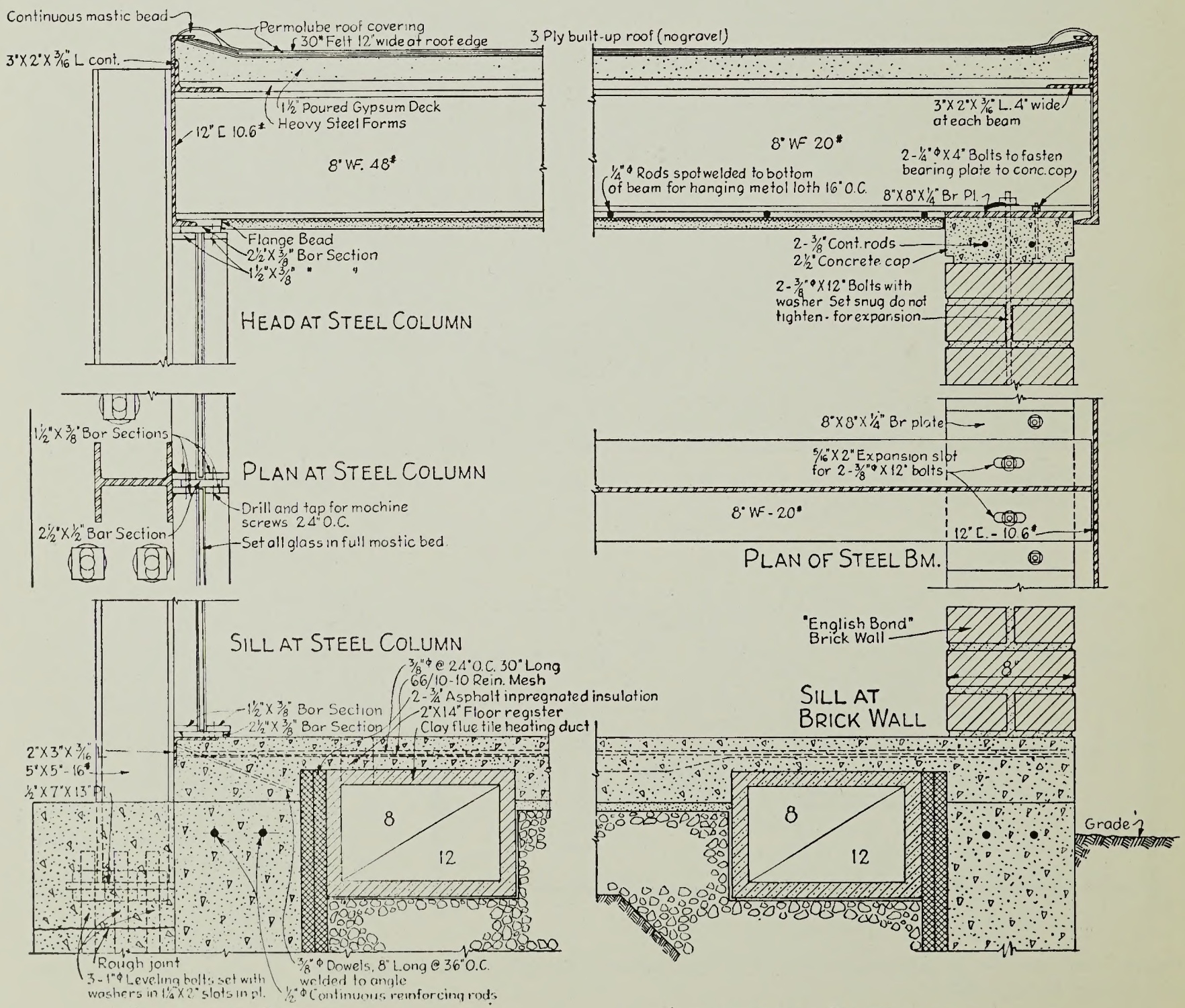


Construction photograph shows the steel in place and the plumbing core for interior bathroom-utility area

plumbing core so that the bath, utilities, and kitchen can be backed up.

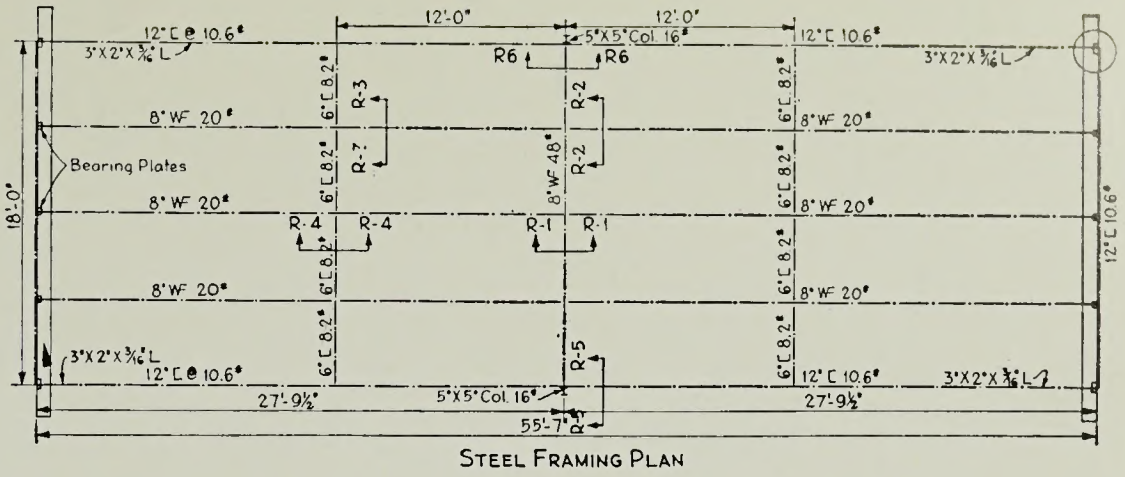
The steel framing of the building has an 8-inch WF 48-pound member running through the center supported on a 5x5 16-pound column. The front and rear members are 12-inch channels of 10.6-pound steel. These are supported on the same 5x5 16-pound column and the masonry end walls.

Intermediate supporting members are 6-inch channel and 8-inch WF units. These members support the

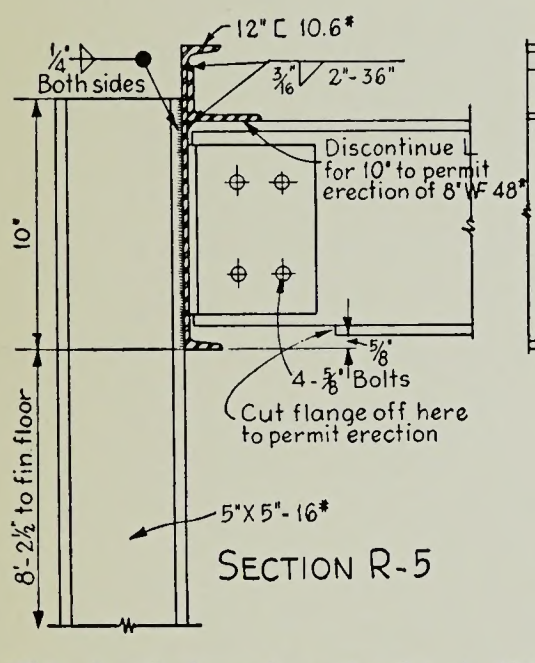

Continuous mastic bead
Permolube roof covering
30# Felt 12" wide at roof edge
3"X 2"X 3/16" L. cont.
1½" Poured Gypsum Deck
Heavy Steel Forms
12" C 10.6#
8" WF. 48#
Flange Bead
2½"X 3/8" Bor Section
1½"X 3/8" " "
HEAD AT STEEL COLUMN
1½"X 3/8" Bor Sections
2½"X½" Bar Section
Drill and tap for machine screws 24" O.C.
Set all glass in full mastic bed
PLAN AT STEEL COLUMN
SILL AT STEEL COLUMN
3/8"Φ @ 24" O.C. 30" Long
66/10-10 Rein. Mesh
2-¾" Asphalt inpregnated insulation
2"X14" Floor register
Clay flue tile heating duct
1½"X 3/8" Bor Section
2½"X 3/8" Bar Section
2"X 3"X 3/16" L
5"X 5"- 16#
½"X 7"X 13" Pl.
8
12
Rough joint
3-1"Φ Leveling bolts set with washers in 1¼"X 2" slots in pl.
3/8"Φ Dowels, 8" Long @ 36" O.C. welded to angle
½"Φ Continuous reinforcing rods
TRANSVERSE SECTION
3 Ply built-up roof (no gravel)
3"X 2"X 3/16" L. 4" wide at each beam
8" WF 20#
¼"Φ Rods spot welded to bottom of beam for hanging metol loth 16" O.C.
2-¼"Φ X 4" Bolts to fasten bearing plate to conc. cap
8"X 8"X ¼" Br Pl.
2-3/8" Cont. rods
2½" Concrete cap
2-3/8"Φ X 12" Bolts with washer Set snug do not tighten - for expansion
8"X 8"X ¼" Br plate
5/16"X 2" Expansion slot for 2-3/8"Φ X 12" bolts
8" WF - 20#
12" C. - 10.6#
PLAN OF STEEL BM.
"English Bond" Brick Wall
8"
SILL AT BRICK WALL
8
12
Grade
LONGITUDINAL SECTION

roof decking material. The roof deck is 1½-inch poured gypsum over a heavy duty "Corruform" base. Roof is finished with a 3-ply built-up construction.

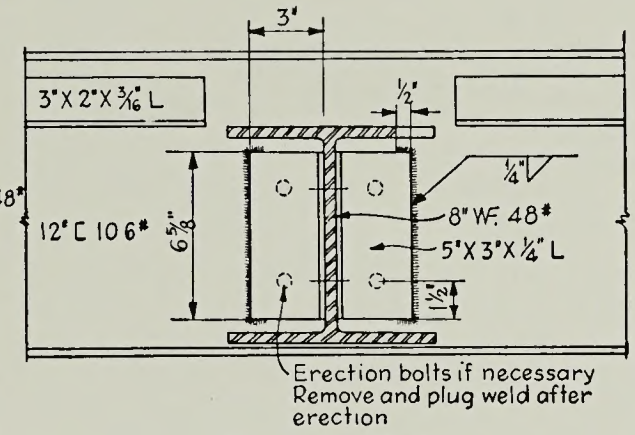
The ceiling of the house has ¼-inch steel rods welded to the underside of the steel beams every 16 inches. Metal lath is tied to the rods and plastered. Side walls are masonry, front and rear walls are glass, and the interior partition walls are non-bearing plywood or plasterboard.



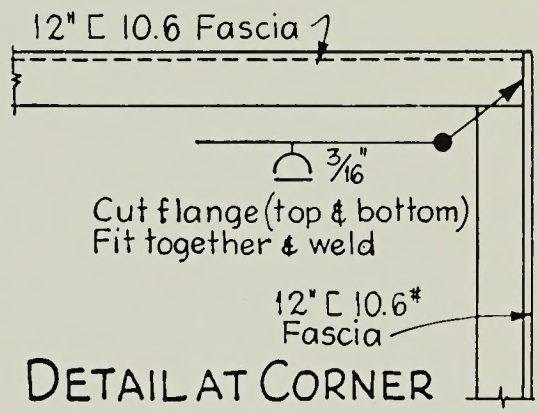
STEEL FRAMING PLAN



SECTION R-5



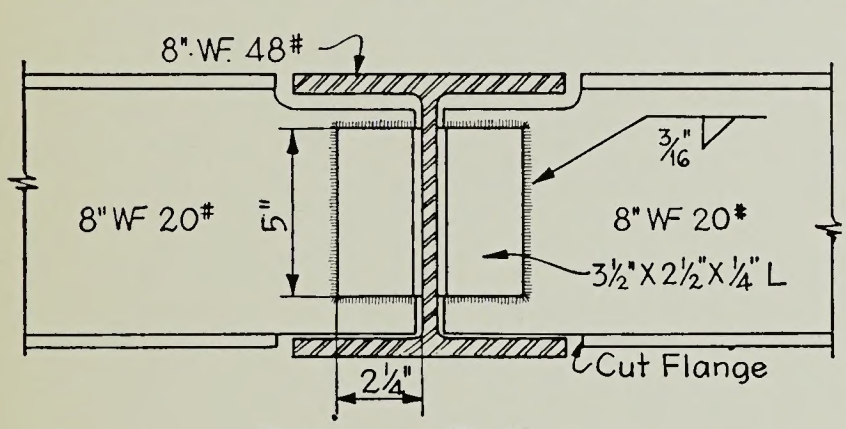
SECTION R-6



DETAIL AT CORNER

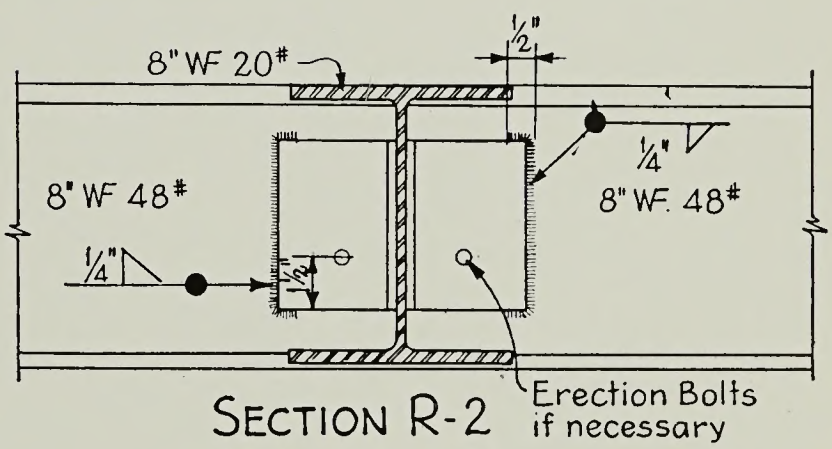
Detail shows the 12-inch channel used as a fascia around the building

This detail shows how the 8-inch WF 48-inch beam is fastened to 5x5 column



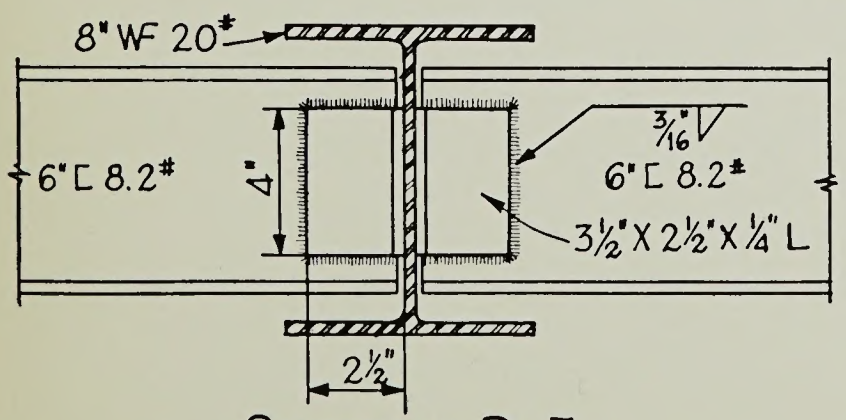
SECTION R-1

This detail shows the steel girder construction which spans the center of the building. Member is an 8-inch WF 48-pound steel beam



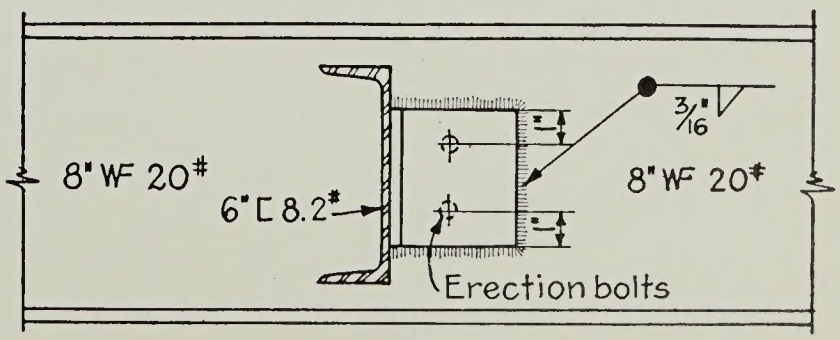
SECTION R-2

Smaller 8-inch WF 20-pound steel beam spans the distance between the masonry wall and the large beam center support



SECTION R-3

This details the connection of the 6-inch channel and the 8-inch WF 20-pound member



SECTION R-4

Six-inch channel and its connection with the 8-inch WF 20-pound member

Light steel framing allowed for the copious use of glass curtain walls in this California home, to take full advantage of a magnificent view of San Francisco Bay.

BETHLEHEM STEEL COMPANY, *GENERAL OFFICES:* BETHLEHEM, PA.

SALES OFFICES

Albany 7 . . . . . 90 State St.
Atlanta 1 . . . . . 55 Marietta St.
Baltimore 3 . . . . . 300 St. Paul Place
Boston 10 . . . . . 75 Federal St.
Buffalo 2 . . . . . 424 Main St.
Chicago 1 . . . . . Prudential Plaza
Cincinnati 2 . . . . . 4th and Walnut Sts.
Cleveland 13 . . . . . 50 Public Square
Columbus 15 . . . . . 17 South High St.
Dallas 2 . . . . . 1412 Main St.
Dayton 2 . . . . . 120 West Second St.
Detroit 2 . . . . . 3044 West Grand Blvd.
Greensboro, N. C. . . . . 101 North Elm St.
Houston 1 . . . . . 7100 Clinton Drive
Indianapolis 4 . . . . . 5 East Market St.
Jacksonville 3, Fla. . . . . 101 Cantee St.
Johnstown, Pa. . . . . 119 Walnut St.
Milwaukee 2 . . . . . 735 North Water St.
New Haven 10 . . . . . 205 Church St.
New York 4 . . . . . 25 Broadway
Philadelphia 3 . . . . . 1617 Pennsylvania Blvd.
Pittsburgh 22 . . . . . Mellon Square
Providence 3 . . . . . 111 Westminster St.
Richmond 19, Va. . . . . 219 East Broad St.
St. Louis 3 . . . . . 1221 Locust St.
St. Paul 1 . . . . . 335 Robert St.
Springfield 3, Mass. . . . . 44 Vernon St.
Syracuse 2 . . . . . 420 East Genesee St.
Toledo 2 . . . . . 709 Madison Ave.
Tulsa 3 . . . . . 15 East Fifth St.
Washington 5, D.C. . . 730 Fifteenth St., N.W.
York . . . . . 25 North Duke St.

On the Pacific Coast Bethlehem products are sold by

BETHLEHEM PACIFIC COAST STEEL CORPORATION, *GENERAL OFFICES:* 20TH AND ILLINOIS STREETS, SAN FRANCISCO 19

SALES OFFICES

Los Angeles . . 6000 South Boyle Ave., Vernon
Portland 5 . . . . . 1010 S.W. Fourteenth Ave.
Salt Lake City 11 . . . . 455 East Fourth South
Seattle 4 . . . . . 3651 East Marginal Way
Spokane 4 . . . . . West 725 Sprague Ave.
Phoenix . . . . . 213 North First Ave.

EXPORT DISTRIBUTOR: **BETHLEHEM STEEL EXPORT CORPORATION, 25 BROADWAY, NEW YORK 4, N. Y.**

Booklet 499

5810, Printed in U.S.A.